

FABRICATED THE NEW WORLD OF 3D PRINTING

3D打印

从想象到现实

[美] 胡迪·利普森 Hod Lipson　梅尔芭·库曼 Melba Kurman ◎著

赛迪研究院专家组◎译

全球第一本全面讲述3D打印的著作，中英文同步出版

3D打印风靡全球，第三次工业革命的序幕拉开了！

揭开3D打印神秘面纱：让传统制造瞬间过时，规模经济的铁律从此被打破

跨越虚拟世界与实体世界的鸿沟，一场产品制造和设计的革命即将开始，它将颠覆我们的物理世界

张瑞敏：“3D打印对现有企业而言，要么是天使，要么是魔鬼。”

中信出版社·CHINA CITIC PRESS

3D打印 从想象到现实

[美] 胡迪·利普森 Hod Lipson　梅尔芭·库曼 Melba Kurman ◎著
赛迪研究院专家组 ◎译

"赛迪译丛"系列之二

FABRICATED
THE NEW WORLD OF 3D PRINTING

中信出版社 · CHINA CITIC PRESS · 北京 ·

□□□□□□□CIP□□□

3D□□□□□□□□□/□□□□□□□□□□□□□□□□□□□□□□□. —□□□□□□□□□

2013.4

□□□□□Fabricated: The New World of 3D Printing

ISBN 978–7–5086–3858–4

Ⅰ.3… Ⅱ.①□… ②□… ③ □… Ⅲ.□□□□–□□–□□□□–□□–□□–□□

Ⅳ.F149

□□□□□□□CIP□□□□□2013□□044424□

3D□□□□□□□□□

□ □□[□] □□·□□□ □□□·□□

□ □□□□□□□□□□

□□□□□□□□□□□（China CITIC Press□

□□□□□ □□□□□□□□□□□□

□□□□□□□□□□□□4□□□□□2□ □□ 100029□

□CITIC Publishing Group□

□ □ □□□□□□□□□□□□
□ □□787mm×1092mm 1/16 □ □□16
□ □□20 □ □□213□□
□ □□2013□4□□1□ □ □□2013□4□□1□□□
□□□□□01–2013–1170 □□□□□□□□□□□□8087□
□ □□ISBN 978–7–5086–3858–4/F·2850
□ □□49.00□

□□□□·□□□□
□□□□□□□□□□□□□□□□□□□□□□
□□□□□010–84849555 □□□□□010–84849000
□□□□□author@citicpub.com

FABRICATED The New World of 3D Printing

[illegible]3D[illegible]

3D[illegible]3D[illegible]……

[illegible]3D[illegible]3D[illegible]

3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

21[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]12[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]

……

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]19[illegible]20[illegible]21[illegible]……[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

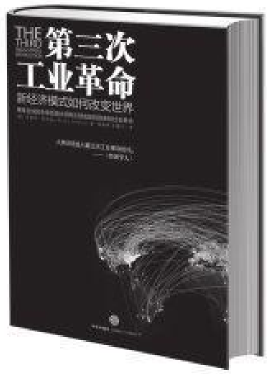
[illegible]·[illegible]

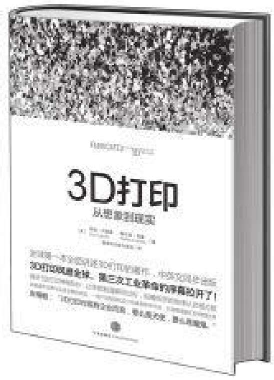
[illegible]

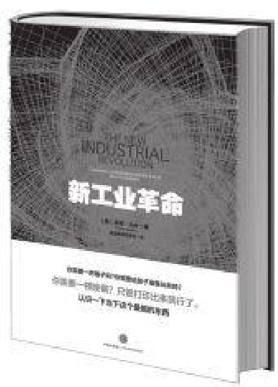
[illegible]

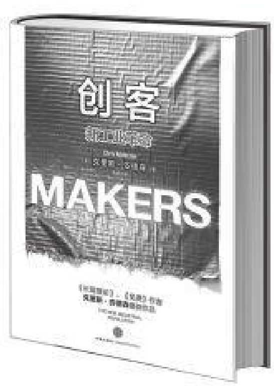
[illegible]10[illegible]

[illegible]


第三次
工业革命
新经济模式如何改变世界


3D打印
从想象到现实


INDUSTRIAL
新工业革命


创客
新工业革命
MAKERS

□　□

FABRICATED The New World of 3D Printing [illegible]

3D[illegible]Three Dimensions[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]—[illegible]—[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]

FABRICATED The New World of 3D Printing [illegible]

[illegible]

[illegible]

> “[illegible]”

[illegible]

[illegible]

> “[illegible]”

[illegible]

> “[illegible]”

[illegible]

[illegible]

[illegible]

FABRICATED The New World of 3D Printing [illegible]

3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

2008[illegible]9[illegible]·[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]Fab@Home[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]2000[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]2013[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

1. 3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]

2. 3D[illegible]

3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

3. 3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

4. 3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible] 3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible] 3D [illegible] 3D [illegible] 3D [illegible]

[illegible]

[illegible]

[illegible] 3D [illegible] 3D [illegible]

[illegible]

FABRICATED The New World of 3D Printing [illegible]

3D[illegible]

[illegible]9[illegible]“[illegible]3D[illegible]”[illegible]3D[illegible]

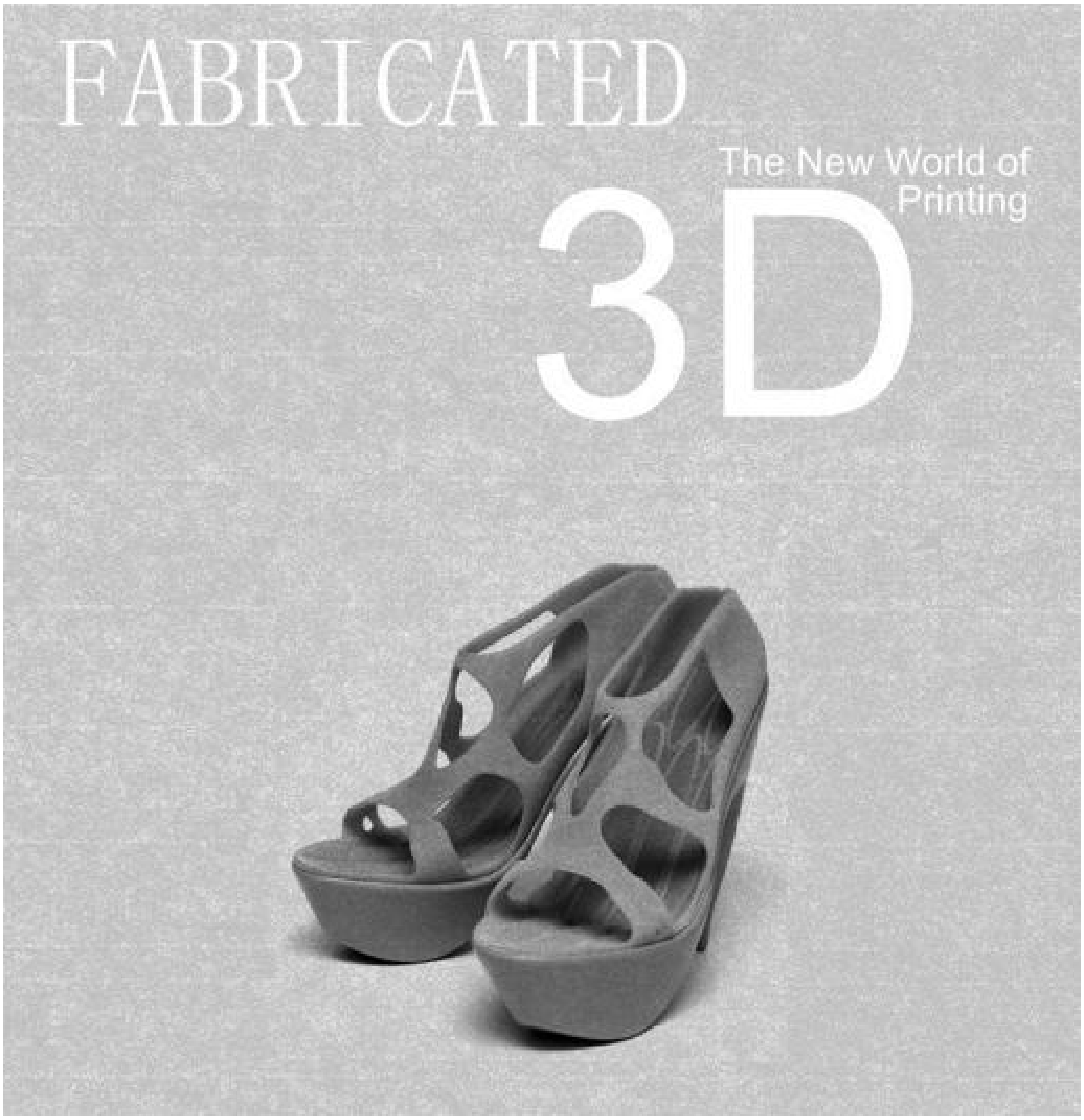
[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]20[illegible]

[illegible]

[illegible]1[illegible] [illegible]



[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]—20[illegible]80[illegible]“[illegible]”[illegible]—[illegible]—[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”

[illegible]

[illegible]

[illegible]20[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]—[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]Fabber[(1)][illegible]Fabber[illegible]—[illegible]99[illegible]

[illegible]Fabber[illegible]—[illegible]

[illegible]Fabber[illegible]—[illegible]15[illegible]

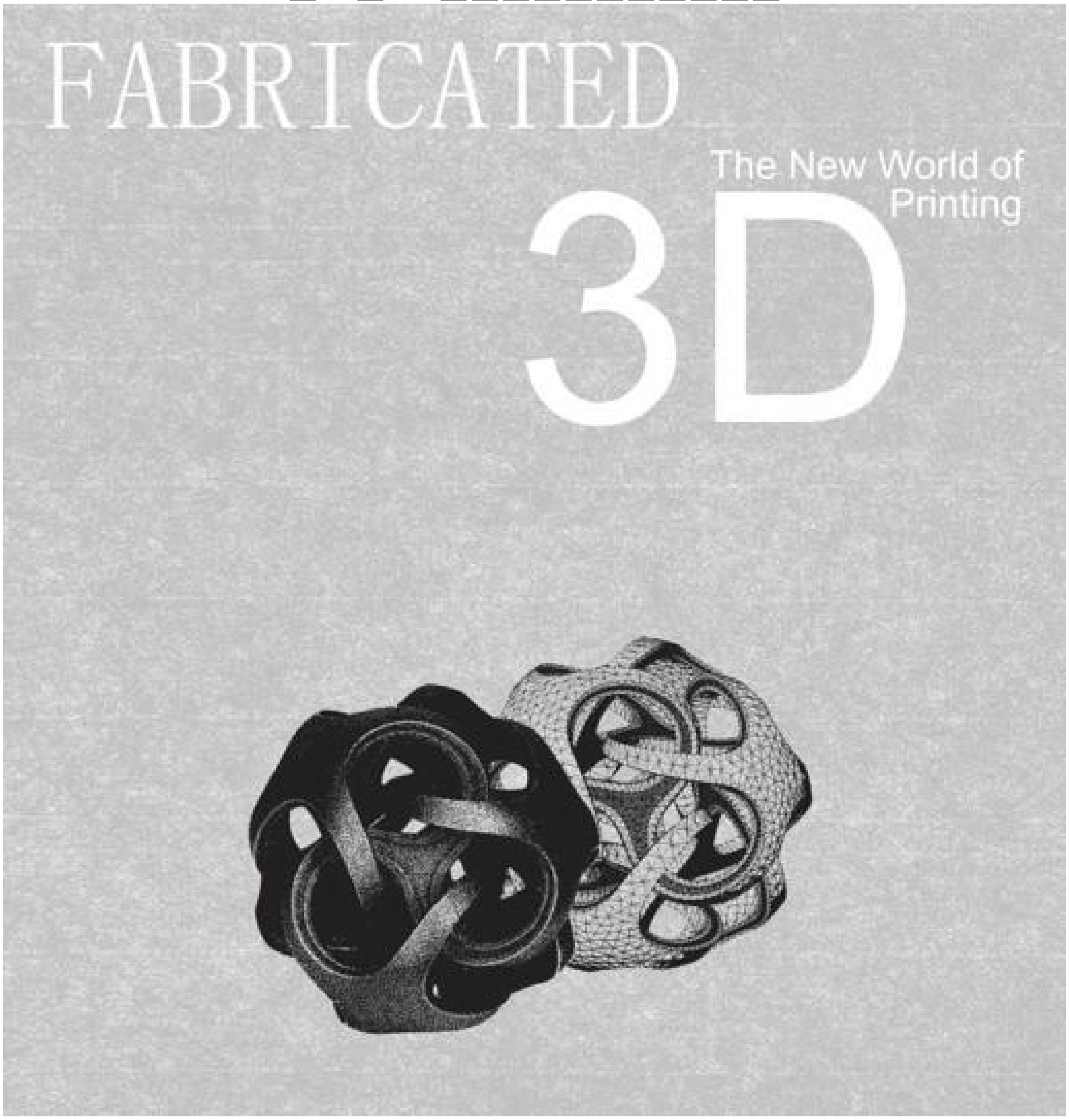
[illegible]Fabber[illegible]“[illegible]”[illegible]24[illegible]

“[illegible]”[illegible]“[illegible]”

[illegible]

(1) Fabber[illegible]——[illegible]

□2□ □□□□□□□□□□



□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

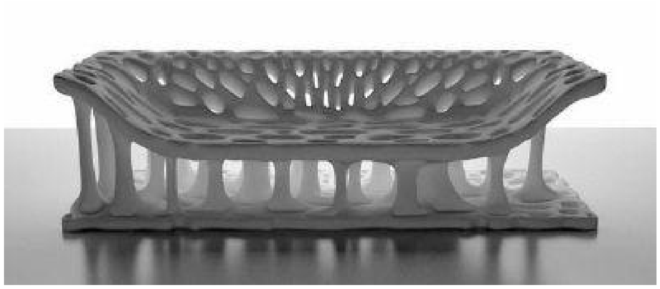
□□3D□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□

□□□□□□□□□□□□□□□□□3D□□□3D□□□□□□

[illegible]3D[illegible]

3D[illegible]



[illegible]2–1 [illegible]

[illegible]Andrea Morgante and Enrico Dini, D-Shape

[illegible]3D[illegible]

[illegible]20[illegible]80[illegible]

[illegible]“[illegible]”[illegible]Cubital Systems[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]“[illegible]‘[illegible]’[illegible]”

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]



‘Revolutionary’

Machine makes 3-D objects from drawings

By Kathleen Sullivan
American-Statesman Staff

Wedged into the corner of an unused photo lab at the University of Texas is an ungainly machine that can transform a computer drawing into a three-dimensional model at the touch of a button.

Sometime next year, the machine, which was developed by a UT graduate student, will make its way out of the lab and into the commercial arena. It will leave with the blessing of the UT Board of Regents, which Thursday gave an Austin company exclusive licensing rights to the “revolutionary” new technology embodied in the machine.

The licensing pact paves the way for the first transfer of technology from the University of Texas at Austin to a commercial venture.

The company that won the right to market the invention is Nova Automation Corp., whose principal shareholders are an Austin consulting engineer and Nova Graphics International Corp., an Austin-based computer graphics software firm.

The agreement represents a “hard fought” victory for UT's fledgling Center for Technology Development and Transfer, said Meg Wilson, coordinator of the center, which was given life during the last Texas Legislature and got

See Inventor, A11

Staff photo by Ralph Barrera

Associate Professor Joe Beaman shows some three-dimensional plastic models made by the ‘selective laser centering’ device developed by Carl Deckard, left.

[illegible]2–2 [illegible]·[illegible]·[illegible]1986[illegible]

[illegible]Carl Deckard and Joe Beaman

[illegible]“[illegible]”

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]

[illegible]20[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

3D[illegible]

3D[illegible]“[illegible]”[illegible]3D[illegible]

3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]iPod[illegible]

3D[illegible]3D[illegible]3D[illegible]

3D[illegible]3D[illegible]



[illegible]2–3 [illegible]10 000[illegible]

[illegible]Stratasys Inc.

3D[illegible]3D[illegible] 3D[illegible]

[illegible]X[illegible]—[illegible]787[illegible]32[illegible]3D[illegible]

3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

20[illegible]90[illegible]1995[illegible]*Being Digital*[illegible]·[illegible]“[illegible]”[illegible]

[illegible]20[illegible]21[illegible]

[illegible]“[illegible]”[illegible]

3D[illegible]

[illegible]

[illegible]

3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]“1”[illegible]“0”

[illegible]3D[illegible]3D[illegible]

[illegible]22[illegible]3D[illegible]

[illegible]3D[illegible]10[illegible]

[illegible]3D[illegible]1[illegible]0[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]



2–4

Objet Inc.

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]20[illegible]90[illegible]3D[illegible]

[illegible]·[illegible]*When Things Start to Think*[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]“[illegible]‘[illegible]’[illegible]”

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]CT[illegible]3D[illegible]

[illegible]CT[illegible]3D[illegible]CT[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]CT[illegible]3D[illegible]

[illegible]CT[illegible]CT[illegible]3D[illegible]



[illegible]2–5

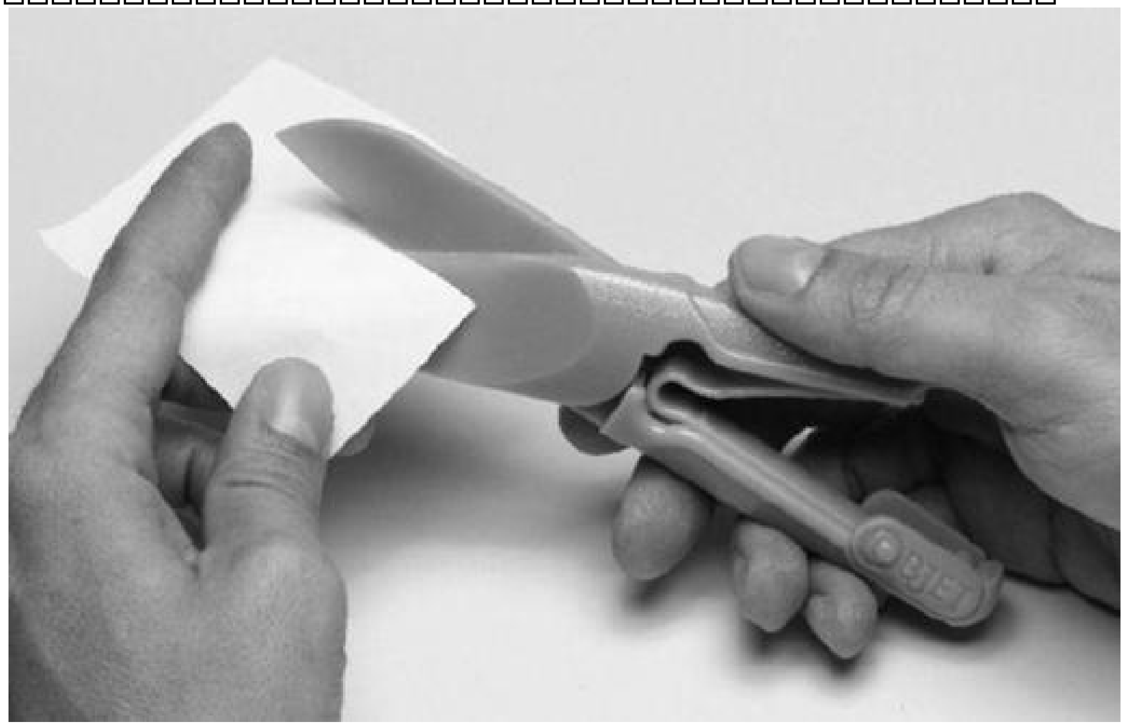
[illegible]CT[illegible]3D[illegible]3D[illegible]

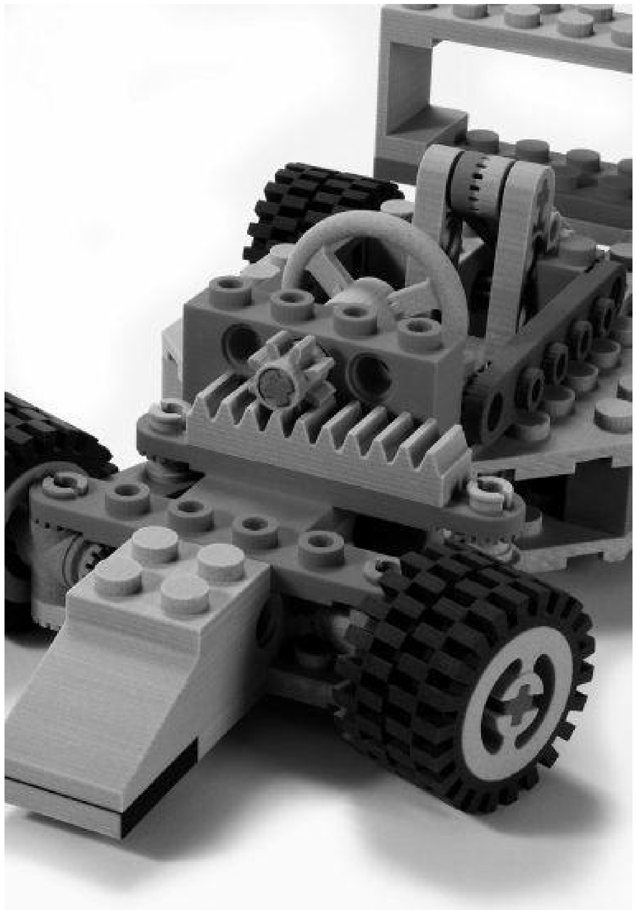
[illegible]Cornell University. Curator David I. Owen; Design: Natasha Gangjee; Photo

3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]





[illegible]2–7

[illegible]3D[illegible]

[illegible]Printed on ZPrinter 650 courtesy of 3D Systems

[illegible]5[illegible]3D[illegible]

[illegible]6[illegible]3D[illegible]3D[illegible]

[illegible]7[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]8[illegible]3D[illegible]90%[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]



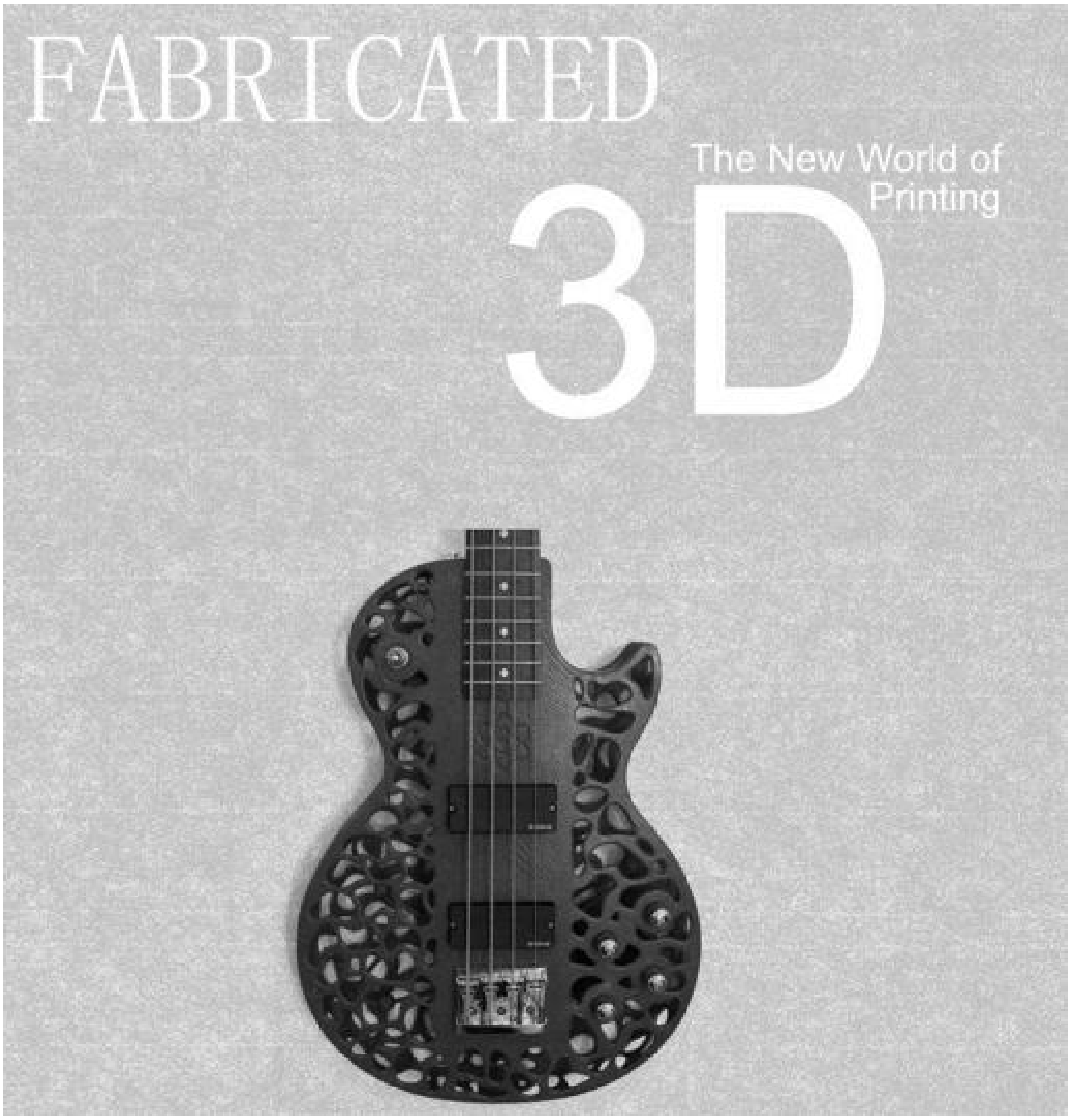
[illegible]2–8 [illegible]3D[illegible]

[illegible]Kerrie Luft

[illegible]9[illegible]3D[illegible]

[illegible]10[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]


FABRICATED
The New World of
Printing
3D

[illegible] 28 000 [illegible]

[illegible]

[illegible]

[illegible] “[illegible]” [illegible]

[illegible]

[illegible]

[illegible] — [illegible]



[illegible]3–1 [illegible]

[illegible]
[illegible] KenPlas Inc.

[illegible]

[illegible] 3D [illegible]

[illegible] 3D [illegible]

[illegible] 3D [illegible]
3D [illegible]

[illegible] 3D [illegible] 3D [illegible] 1 000 [illegible] 1 000 [illegible]

[illegible] 3D [illegible] 3D [illegible] 3D [illegible]

3D [illegible] 3D [illegible]

[illegible] 3D [illegible]

[illegible] 3D [illegible] “[illegible]” [illegible] 3D [illegible]

[illegible]

[illegible] “[illegible]” [illegible]

[illegible]

[illegible]

[illegible]20[illegible]70[illegible]

[illegible]15[illegible]

[illegible]—3D[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]3D[illegible]”

[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]1[illegible]3[illegible]3D[illegible]”

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]3D[illegible]CAD[illegible]”

[illegible]

3D[illegible]3D[illegible]



[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]/[illegible]“Surface”[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

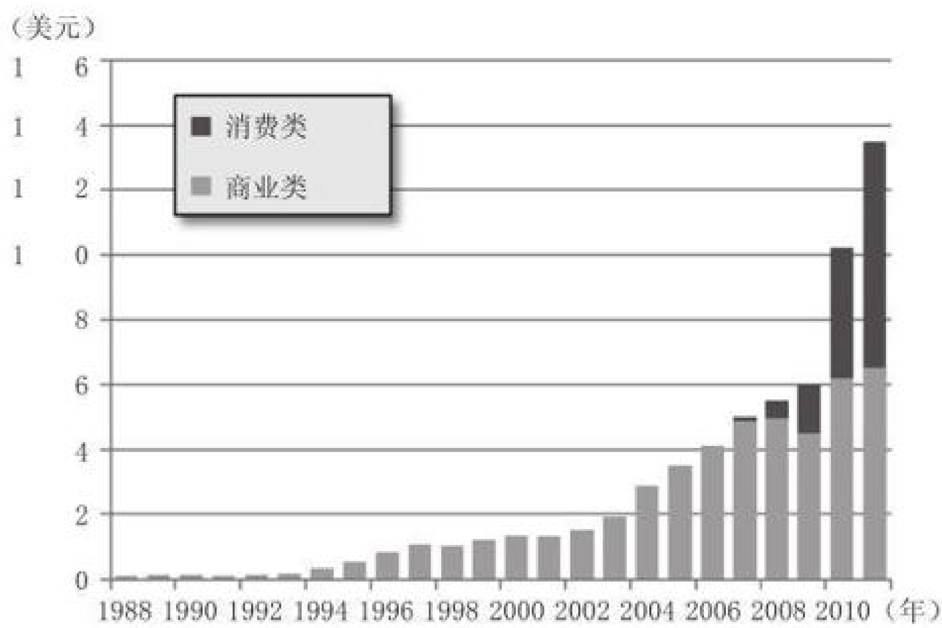
3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]3D[illegible]747[illegible]”[illegible]3D[illegible]

[illegible]8.5%



（美元）
16
14
12
10
8
6
4
2
0
消费类
商业类
1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010（年）

□□2007□□□□□□□□□□□3D□□□□□□□□□□5 000□□□□□□□□□□3D□□□□
□□□□

□□□□□Wohlers Associates, Inc., and Tuan TranPham

21□□□□□□□

□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□700□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□3D□□3D□□□3D□□□□□□□□□□□

□□□□□□□□□□□3D□□·□□□□□□□□□□□□□□3D□□



[illegible]3–4 3D[illegible]

[illegible]Olaf Diegel, New Zealand

3D[illegible]3D[illegible]3D[illegible]“IBM[illegible]”[illegible]3D[illegible]20[illegible]80[illegible]3D[illegible]3D[illegible]“3D[illegible]”[illegible]3D[illegible]

3D[illegible]·[illegible]3D[illegible]“21[illegible]”[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]3D[illegible]MakerBot[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]20[illegible]80[illegible]3D[illegible]·[illegible]3D[illegible]SLA1[illegible]3D[illegible]20[illegible]60[illegible]SLA1[illegible]3D[illegible]1987[illegible]IBM PC[illegible]

[illegible]24[illegible]3D[illegible]—3D[illegible]

3D[illegible]·[illegible]3D[illegible]3D[illegible]“[illegible]3D[illegible]”

3D[illegible]Windows[illegible]Office[illegible]iPad[illegible]iPhone[illegible]iPod[illegible]app[illegible]

[illegible]3D[illegible]24[illegible]3D[illegible]

[illegible]“[illegible]3D[illegible]3D[illegible]3D[illegible]/[illegible]/[illegible]3D[illegible]”

3D[illegible]·[illegible]3D[illegible]2010[illegible]3D [illegible]Desktop Factory[illegible]3D[illegible]3D[illegible]3D[illegible]

1986[illegible]·[illegible]3D[illegible]3D[illegible]·[illegible]“[illegible]”[illegible]“[illegible]“[illegible]”[illegible]”[illegible]“[illegible]”

[illegible]3D[illegible]3D[illegible]3D[illegible]

“[illegible]”[illegible]“[illegible]‘[illegible]’[illegible]‘[illegible]’[illegible]”

[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]Altair phase[illegible]20[illegible]70[illegible]

[illegible]3D[illegible]“[illegible]iPad[illegible]iPad[illegible]”

[illegible]iPad[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]·[illegible]Motley Fool[illegible]3D[illegible]·[illegible]3D[illegible]“[illegible]3D[illegible]Shapeways[1][illegible]—[illegible]”[illegible]

[illegible]3D[illegible]2010~2011[illegible]3D[illegible]40%[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]·[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]“[illegible]”[illegible]3D[illegible]



[illegible]3–5 [illegible]3D[illegible]
[illegible]Dynacept

[illegible]

[illegible]

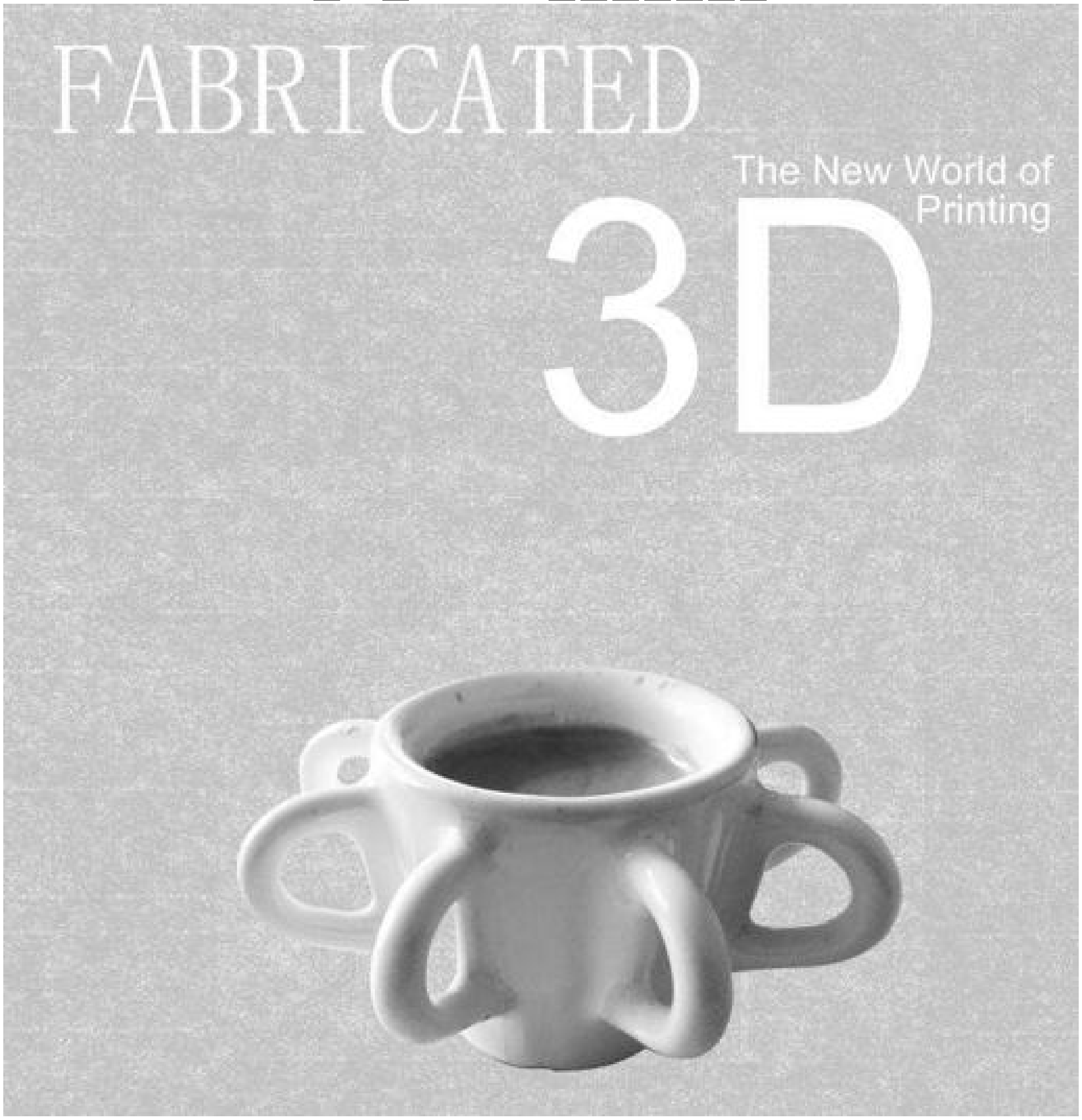
[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]3D[illegible]”

[illegible]

(1)Shapeways[illegible]3D[illegible]—[illegible]

[illegible]4[illegible] 3D[illegible]



[illegible]3D[illegible]3D[illegible]3D[illegible]“3D[illegible]”

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]60%[illegible]

[illegible]

3D[illegible]“[illegible]”

[illegible]·[illegible][1][illegible]“[illegible]”[illegible]3D[illegible]

[illegible]1[illegible]1[illegible]

[illegible]

[illegible]

[illegible]1[illegible]3D[illegible]

[illegible]1[illegible]1[illegible]

[illegible]1 000[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]DIY[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]2005[illegible]DIY[illegible]Maker Faire[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]“3D[illegible]DIY”[illegible]2011[illegible]“[illegible]”[illegible]250[illegible]



[illegible]4–1 [illegible]“2010[illegible]”

[illegible]—[illegible]3D[illegible]358[illegible]“[illegible]”[illegible]Manufacturing in Motion[illegible]

[illegible]7%[illegible]60%[illegible]

[illegible]80%[illegible]3D[illegible]98%[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]20[illegible]70[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]
[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]·[illegible]*The Experience Economy*[illegible]
[illegible]

[illegible]

[illegible]

[illegible]DIY[illegible]

[illegible]

DIY[illegible]3D[illegible]3D[illegible]3D[illegible]

MakerBot[illegible]

MakerBot[illegible]
MakerBot[illegible]3D[illegible]“Cupcake”[illegible]“Replicator 1”[illegible]1[illegible]“Replicator 2”[illegible]2[illegible]·[illegible]

[illegible]MakerBot[illegible]MakerBot[illegible]“[illegible]MakerBot[illegible]”[illegible]MakerBot[illegible]thingiverse.com[illegible]DIY[illegible]

[illegible]“[illegible]”[illegible]MakerBot[illegible]MakerBot[illegible]“[illegible]

[illegible]”[illegible]“[illegible]”[illegible]·[illegible]



[illegible]4–2 [illegible]MakerBot[illegible]BotCave[illegible]3D[illegible]

[illegible]MakerBot[illegible]MakerBot[illegible]·[illegible]·[illegible]·[illegible]

[illegible]MakerBot[illegible]MakerBot[illegible]3[illegible]DIY[illegible]·[illegible]3D[illegible]·[illegible]MakerBot[illegible]MakerBot[illegible]

MakerBot[illegible]3D[illegible]MakerBot[illegible]

Shapeways[illegible]

[illegible]MakerBot[illegible]3D[illegible]Shapeways[illegible]Shapeways[illegible]/[illegible]3D[illegible]

Shapeways□□□□□□□□□ 2011□□□□□□□MakerBot□□□□Shapeways□□□□□□□2012□□□Shapeways□□□□□□□□□□50□3D□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□

□□□□Shapeways□□□□□□□□□MakerBot□□□Shapeways□□□□□□□□□□□□□□□□□□□□□□□□□□□□□Shapeways□□

Shapeways□□□□□□□□□□·□□□□□□□□□□□□□□□□□□□□□□□Shapeways□□□□□□□“□□”□□□□□□□□□□□□□□□□□6□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□6□□□□



□4–3 Shapeways□□3D□□□□□□□□□□□

2007□□□□□□□□□□□□□□□□□□□□□Shapeways□□3D□□□□□□□□□□“□□□□□□□□□□□□□□□□□□□□”□□□□□□□□3D□□□□□□□□□□□□“□□”□□□□□□□□□□

“Shapeways□□□□□□□□□□□□□□□□□□□”□□□□□“2002□□□□·□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□”□□□

□□□□□□□Shapeways□□3D□□□□□□□□□□□□□□□□□

[illegible]Shapeways[illegible]25[illegible]Shapeways[illegible]·[illegible]·[illegible]Shapeways[illegible]

Shapeways[illegible]DIY[illegible]100kGarages[illegible]100kGarages[illegible]100kGarages[illegible]·[illegible]·[illegible]“[illegible]”[illegible]

100kGarages[illegible]

[illegible]·[illegible]“[illegible]”[illegible]3D[illegible]“[illegible]100kGarages[illegible]”

100kGarages[illegible]Ponoko[illegible]ShopBot Tools[illegible]100kGarages[illegible]100kGarages[illegible]Ponoko[illegible]“[illegible]”[illegible]ShopBot Tools[illegible]

[illegible]100KGarages[illegible]“[illegible]”

[illegible]“[illegible]”

[illegible]“[illegible]”

[illegible]

[illegible]·[illegible]3D[illegible]“[illegible]”

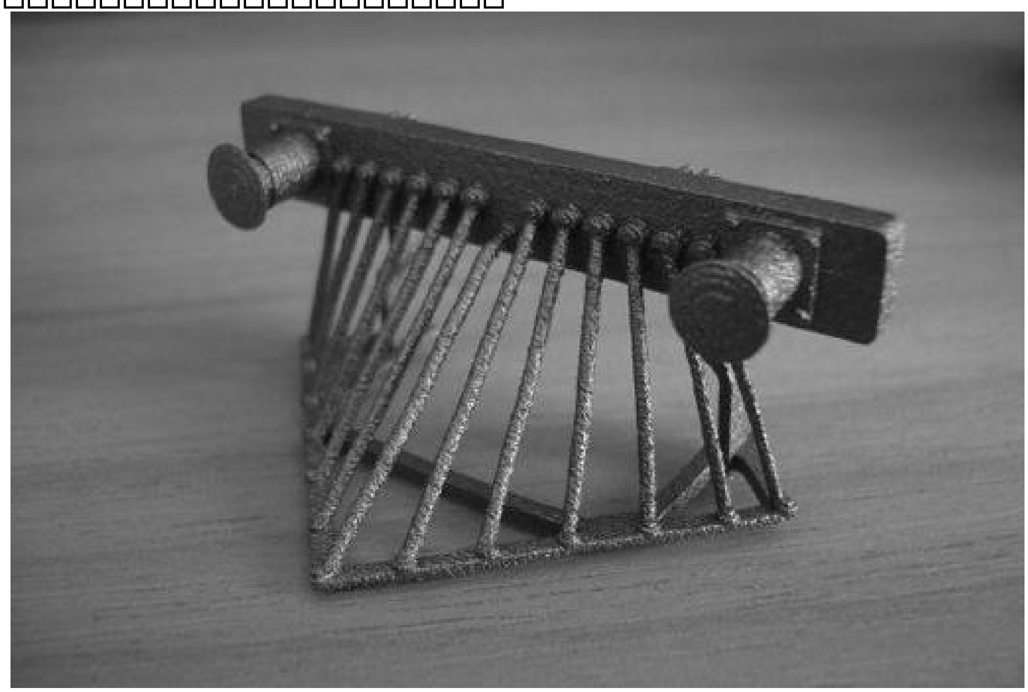
[illegible]

3D[illegible]10 000[illegible]“[illegible]”[illegible]

3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]



[illegible]4–4

[illegible]·[illegible]Shapeways[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]Mark Kendrick

[illegible]“[illegible]”[illegible]

[illegible]

3D[illegible]

3D[illegible]3D[illegible]3D[illegible]

FabApp[illegible]iPhone[illegible]

3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]FabApp[illegible]·[illegible]·[illegible]FabApp[illegible]iPhone[illegible]

[illegible]FabApp[illegible]99[illegible]FabApp[illegible]FabApp[illegible]“[illegible]”[illegible]

FabApp[illegible]iPhone[illegible]FabApp[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]·[illegible]*The Lean Startup*[illegible]

3D[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]1 000[illegible]1 000[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]VCR[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]2009[illegible]7 400[illegible]380[illegible]95%~98%[illegible]

[illegible]

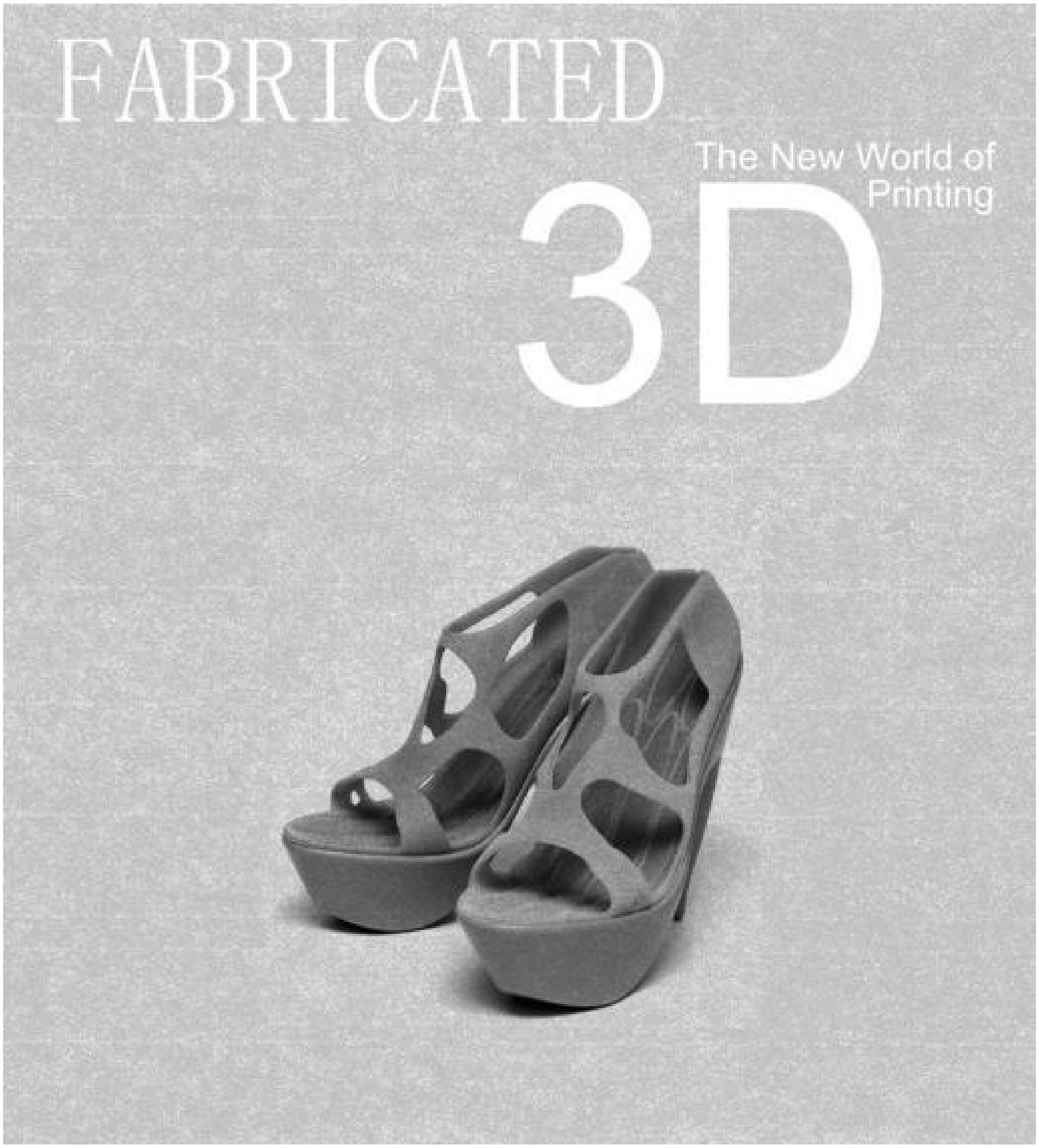
[illegible]

[illegible]3D[illegible]

[illegible]

(1)[illegible]2006[illegible]—[illegible]

□5□ 3D□□□□□□□□



□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□3D□□

3D□□□□□□“□□□□”□□□□□□□3D□□□□□□□“□□”□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□”□□3D□□□□□□□□□□□□□□□□□□□□

[illegible]3D[illegible]3D[illegible]
[illegible]50[illegible]

[illegible]

3D[illegible]ABC[illegible]3D[illegible]
[illegible]ABC[illegible]3D[illegible]·T·
[illegible]ABC[illegible]3D[illegible]

“ABC[illegible]3D[illegible]”[illegible]
[illegible]“[illegible]
[illegible]”

ABC[illegible]1982[illegible]5[illegible]3D[illegible]
[illegible] 20[illegible]90[illegible]
3D[illegible]

[illegible]ABC[illegible]
[illegible]ABC[illegible]35[illegible]
[illegible]550[illegible]ABC[illegible]
[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]‘3D[illegible]’[illegible]
[illegible]3D[illegible]—[illegible]
[illegible]”

ABC[illegible]3D[illegible]
[illegible]3D[illegible]“[illegible]”[illegible]
[illegible]3D[illegible]

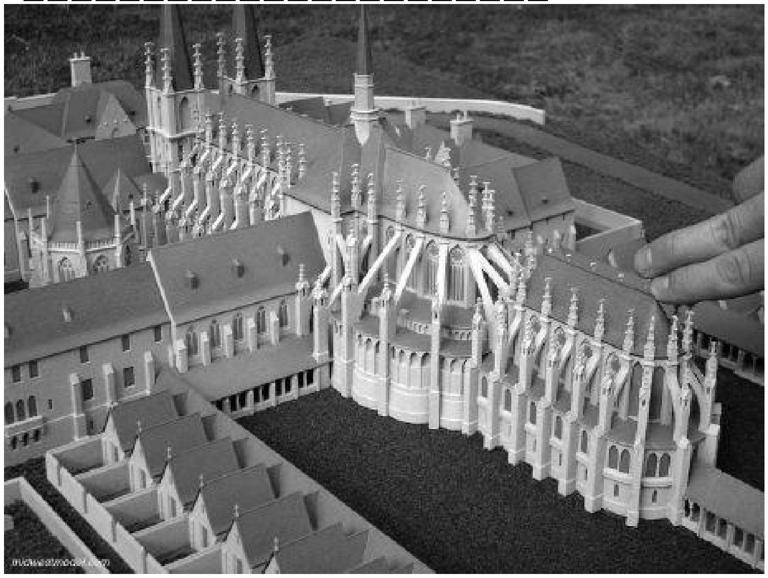
[illegible]3D[illegible]
[illegible]
[illegible]

[illegible]ABC[illegible]3D[illegible]
[illegible]
[illegible]
[illegible]

[illegible]8[illegible]
[illegible]

[illegible]
[illegible]
[illegible]

[illegible]“3D[illegible]
[illegible]3D[illegible]”



[illegible]5–1　3D[illegible]

[illegible]Midwest Studios. Photo[illegible]Ed Watson

3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]“[illegible]”—[illegible]3D[illegible]

[illegible]“[illegible]”—[illegible]

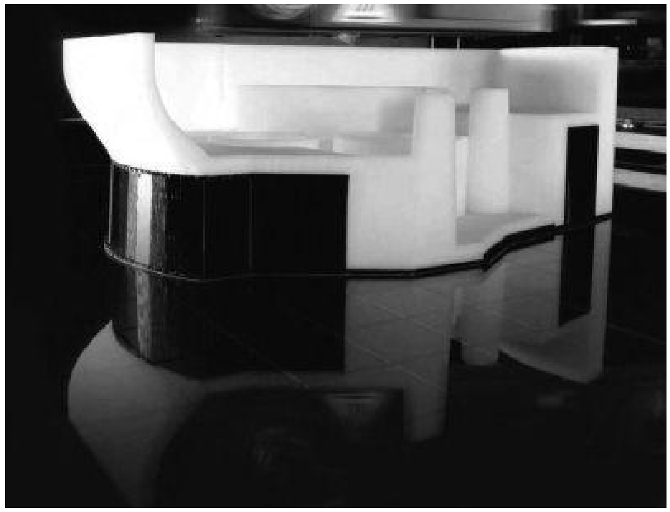
[illegible]

[illegible]MakerBot[illegible]3D[illegible]

[illegible]FDM[illegible]FDM[illegible]·[illegible]20[illegible]80[illegible]“FDM[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]



[illegible]5–2

[illegible]

[illegible]Stratasys Inc.

[illegible]

3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

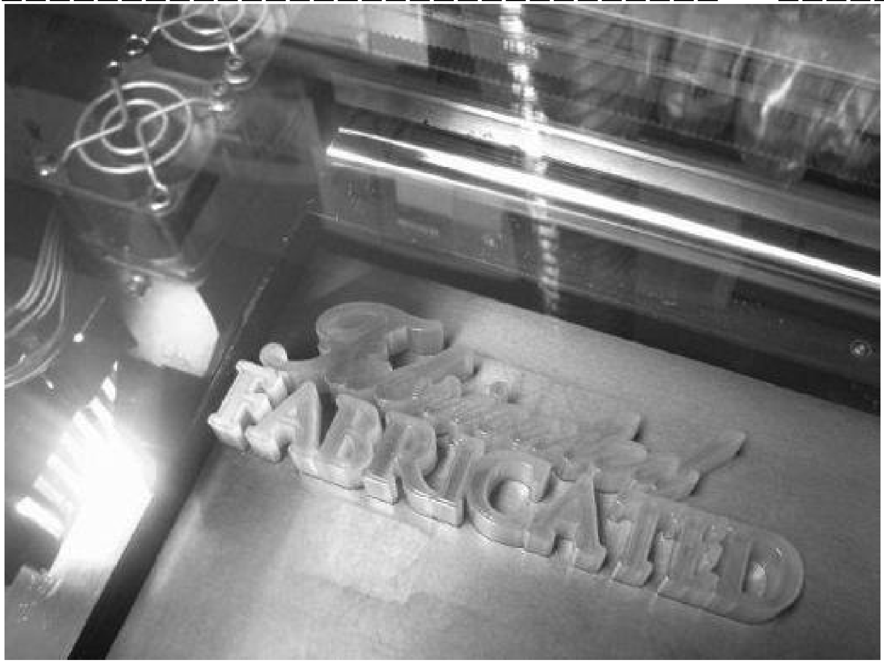
3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

Polyjet[illegible]

Polyjet□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“Objet Geometries”□□□2012□□Stratasys□□□□□□Polyjet□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□UV□□□□□□□□□



□5–3　Polyjet□□□□□□□□□□□

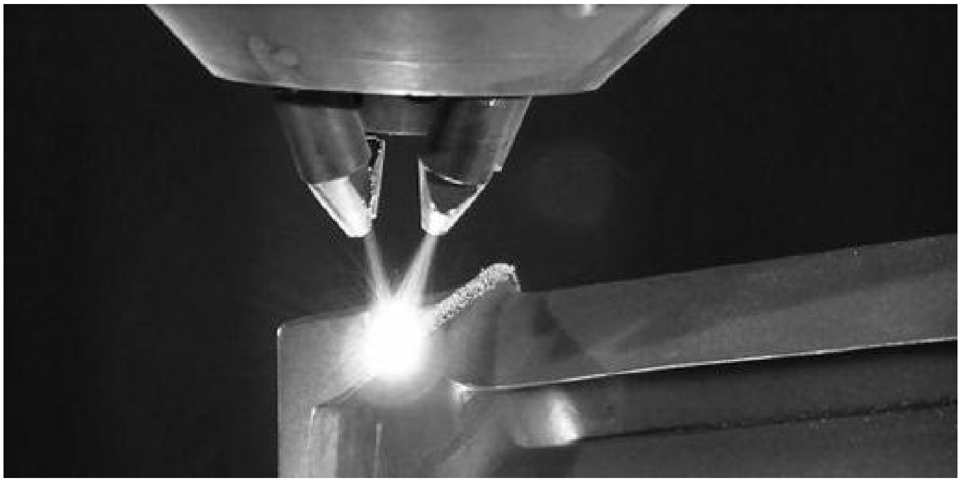
□□Polyjet□□□□□□□□□□□□□□□□□□□□□16□□□□□□□□□□□□□□□10□□□Polyjet□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□Polyjet□□□□□□□□□□□□□□□□□□□□□□□□□□□□

Polyjet□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□□□”□□□□□□□□□□□UV□□

□□□□□□

□□□□□□□□□□□□□LENS□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□”□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□3D□□□LENS□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□LENS□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□



[illegible]5–4 [illegible]

[illegible]Richard GrgIls, Optomec, Inc.

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]LOM[illegible]LOM[illegible]

LOM[illegible]

[illegible]LOM[illegible]LOM[illegible]

[illegible]

3D[illegible]SL[illegible]LS[illegible]

[illegible]

SL[illegible]3D[illegible]UV[illegible]

[illegible]1[illegible]SL[illegible]

□□□□□□3D□□□“□□□”□□□□□□

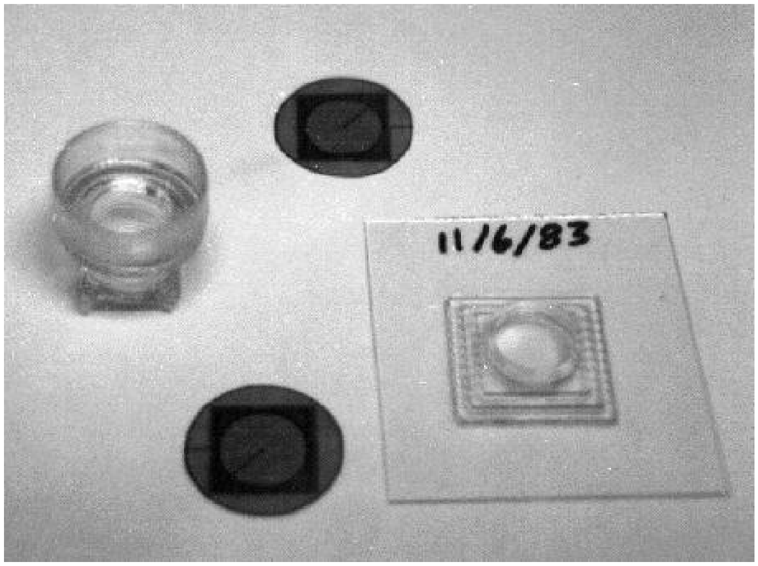
SL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□10□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□SL□□□□□□□□□□□□□□□□□□



□5–5　UV□□□□□□□□□□□□□□□□□□□□□□□□

□□□□Solid Concepts Inc.

SL□□□SL□□□□□□□□□□□□□□□□□□□□□□□□□□SL□□□□□□□□□□□□□□□□□□□□UV□□□□□□□□□□□□□□□□□□□SL□□□□□□□□□□□□



□5–6　□□□□□□□□3D□□□□□□□□SL□□□□□□20□□80□□

□□□□□Chuck Hull

□□□□

□□□LS□□□□□□□□□□□□□□□□□□·□□□□□□□·□□□20□□80□□□□□□□□

LS□□□□□SL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□SL□□□□□□□□□LS□□□□□□□□"□□□□"□□□□□□□□□□□□□□□□□□□□

□□□1□□□

□□

□□□□□□□□LS□□□□□□□□□□□□□□□□□□□□□□□LS□□LS□□□□□□□□□□□□□□□□□



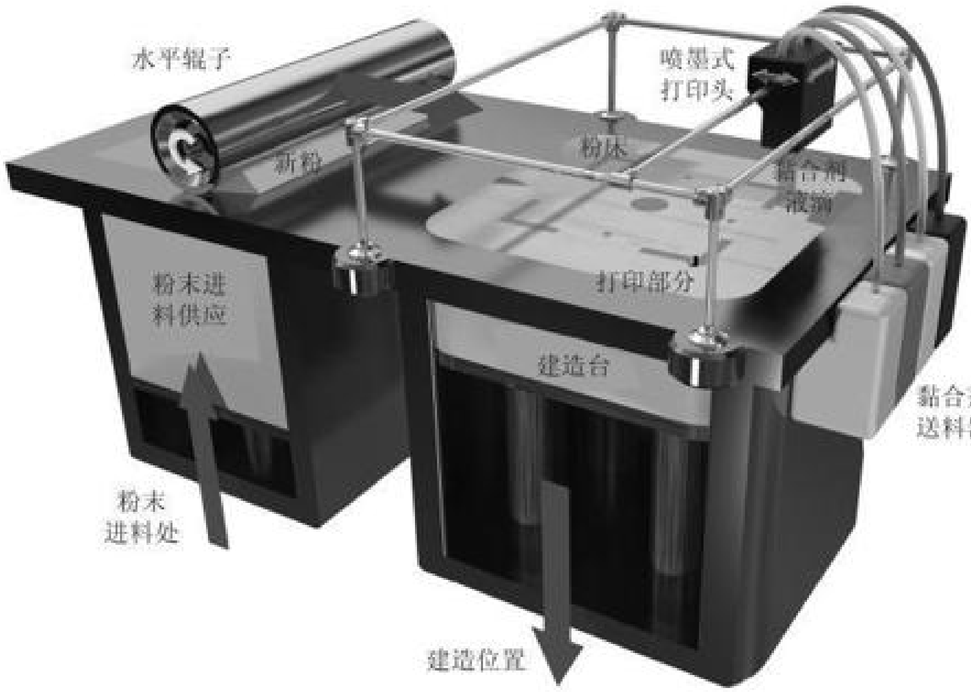
[illegible]5–7 [illegible]
[illegible]Solid Concepts Inc.

[illegible]LS[illegible]

[illegible]

[illegible]3DP[illegible]“[illegible]”[illegible]3DP[illegible]20[illegible]80[illegible]·[illegible]·[illegible]

[illegible]3DP[illegible]3DP[illegible]3D[illegible]

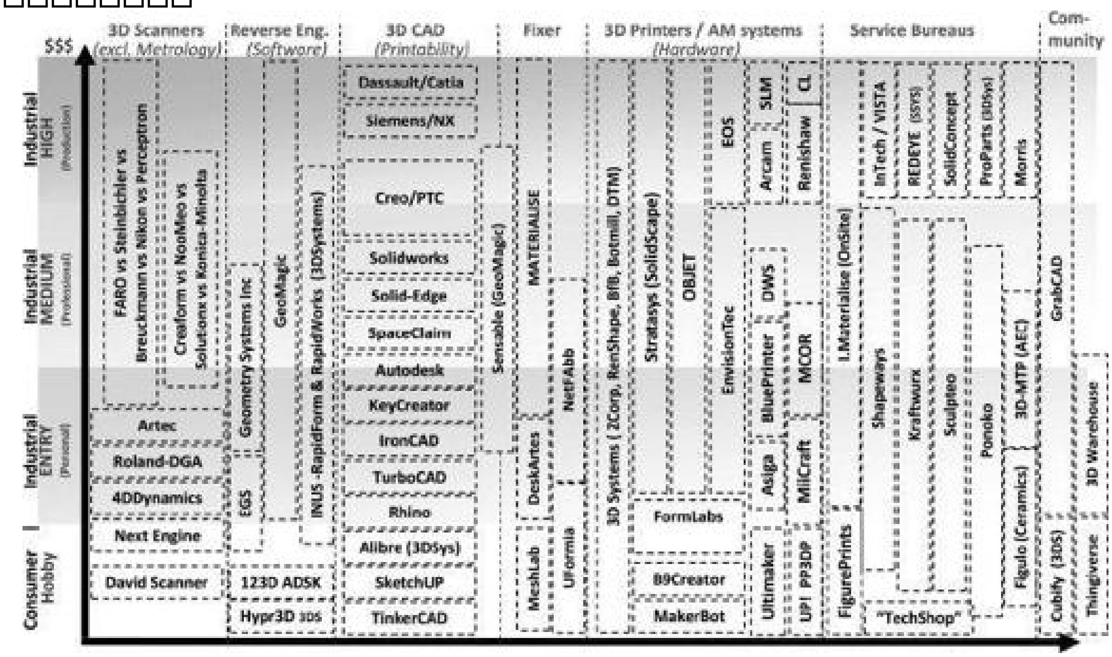

水平辊子
喷墨式
打印头
新粉
粉床
黏合剂
液滴
粉末进
料供应
打印部分
建造台
黏合剂
送料器
粉末
进料处
建造位置

[illegible]ABC[illegible]3D[illegible]Sketchup[illegible]Sketchup[illegible]

3D[illegible]3D[illegible]ABC[illegible]“[illegible]‘[illegible]’[illegible]”

[illegible]“[illegible]3D[illegible]3D[illegible]”

[illegible]“[illegible]”[illegible]“[illegible]”



[illegible]5–9

[illegible]3D[illegible]

[illegible]Tuan TranPham tuan@tranpham.com | @ ttranpham

http://www.linkedin.com/in/ ttranpham

[illegible]3D[illegible]STL[illegible]STL[illegible]SL[illegible]3D[illegible]·[illegible]

□□□□STL□□□□□□□□□□PostScript□□□□□PostScript□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□“□□□□□□□□□□□□□□□□STL□□□□□□□”□□□STL□□□□□□□□□□□3D□□□□□□□□□□□□STL□□□

□□□□STL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□

□□□□□□□□STL□□□□STL□□□□□□□□□□“□□”□□□□□□□□□□□□□□□“□□”□□□

□STL□□□□□□□□□STL□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□STL□□□STL□□□□□□□□□□□□□□□□□□□□□□

□□STL□□□□□□□CAD□CAM□□□□□□□□□□□□□□3D□□□STL□□□□□□□□□□□□□□□□□□□□□□STL□□□□□□□□□“□”□□□□□□□□□□□□□3D□□□□□□□□

STL□□□STL□□□□□□□□□□“□□”□□□□□□□□□□□□□3D□□

□□3D□□□□□□□□□□□□□□□□CAD□ STL□□3D□□□□□□□□□□“□□□□□□□□□□□□□□□□□□□□□”

□□“□□□□□□□□□□□□□□□□□□□□□□□□□□□”



[illegible]5–10 [illegible]

[illegible]3D Systems

[illegible]3D[illegible]

[illegible]ABC[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]“[illegible]”

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]ABC[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]ABS[illegible]SL[illegible]LS[illegible]

3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]



[illegible]5–11 [illegible]

[illegible]Robert MacCurdy

[illegible]3D[illegible]3D[illegible]Fab@Home[illegible]—[illegible]

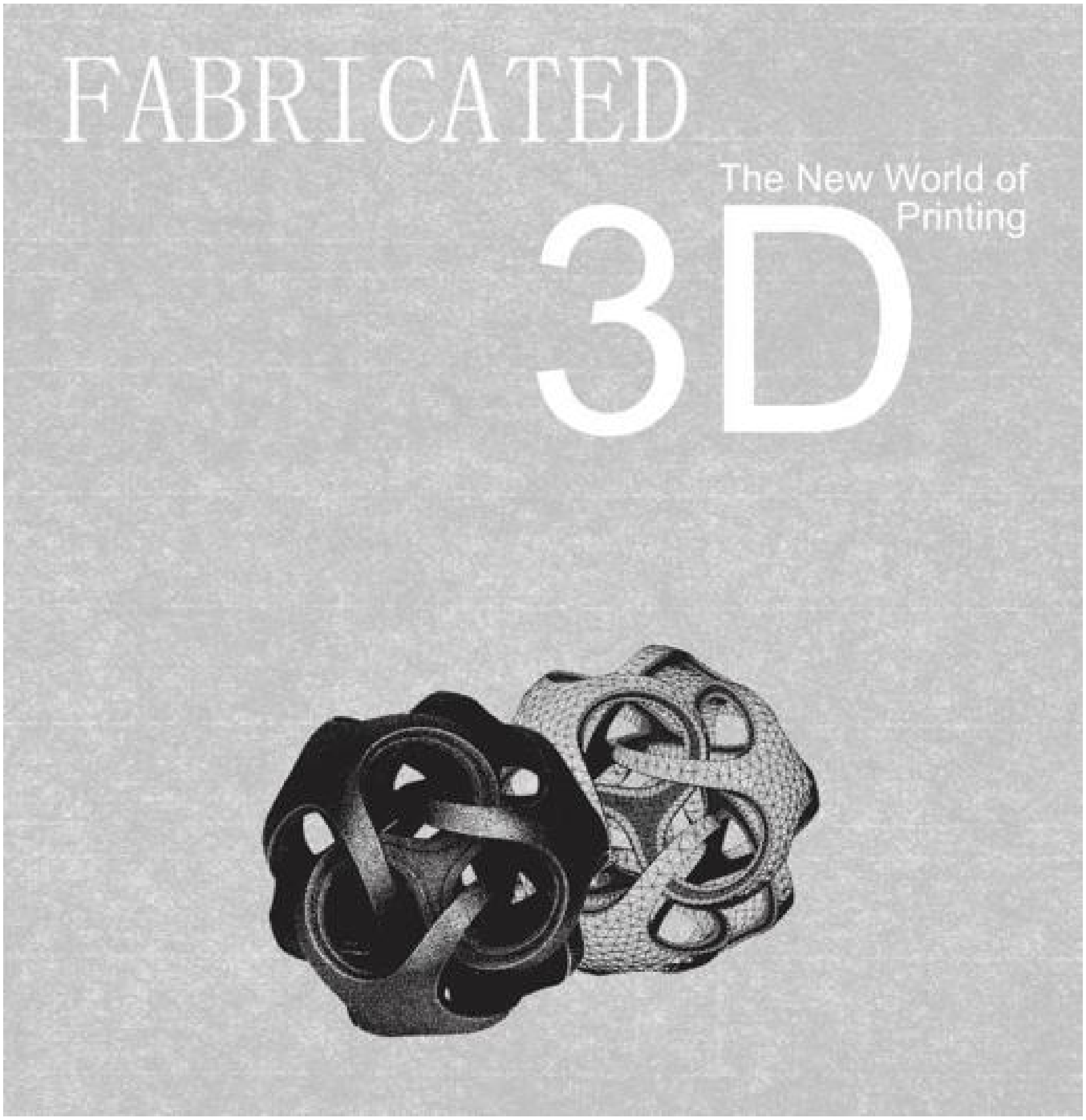
[illegible]CT[illegible]3D[illegible]3~5[illegible]

[illegible]3D[illegible]·[illegible]·[illegible]·[illegible]·[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]ABC[illegible]

“[illegible]3D[illegible]CAD[illegible]”[illegible]“[illegible]”

[illegible]6[illegible] [illegible]



[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]AutoCAD

[illegible]20[illegible]50[illegible]20[illegible]60[illegible]50[illegible]“[illegible]

[illegible]”[illegible]CDC[illegible]
[illegible]1[illegible]1[illegible]30[illegible]

1982[illegible]Autodesk[illegible]·[illegible]
[illegible]
[illegible]“[illegible]”[illegible]·[illegible]3D
[illegible]

[illegible]Autodesk[illegible]
[illegible]“MicroCAD”[illegible]CAD[illegible]
[illegible]MicroCAD[illegible]
[illegible]MicroCAD[illegible]
[illegible]

[illegible]MicroCAD[illegible]
[illegible]“[illegible]70 000[illegible]
Computervision CAD[illegible]CAD[illegible]10 000~15 000[illegible]
[illegible]MicroCAD[illegible]”

[illegible]20[illegible]80[illegible]3D[illegible]
[illegible]3D[illegible]
UNIX[illegible]

[illegible]
[illegible]500[illegible]
[illegible]·[illegible]

[illegible]14[illegible]
[illegible]1[illegible]

[illegible]“[illegible]
[illegible]” MicroCAD[illegible]2D[illegible]
[illegible]

[illegible]Autodesk[illegible]20[illegible]90[illegible]
[illegible]MicroCAD[illegible]AutoCAD—[illegible]
[illegible]20[illegible]70[illegible]
[illegible]

[illegible]Autodesk[illegible]1 000[illegible]
AutoCAD[illegible]“[illegible]”[illegible]AutoCAD[illegible]3D[illegible]
[illegible]

[illegible]

[illegible]·[illegible]

[illegible]“[illegible]”

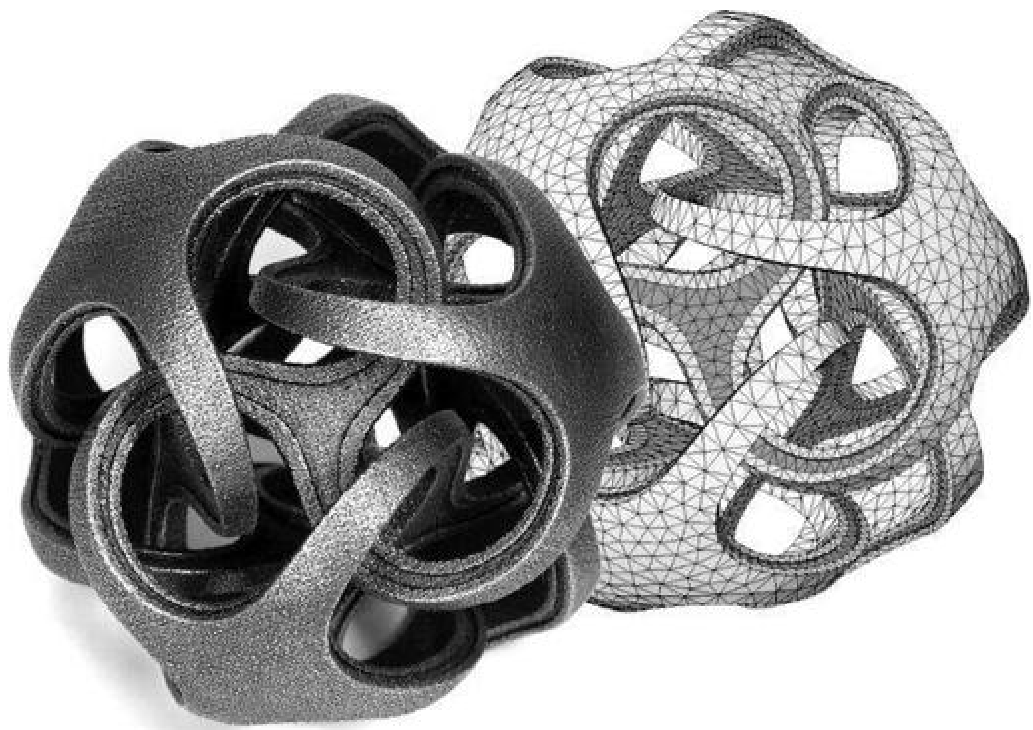
“[illegible]”[illegible]“[illegible]”

“[illegible]”

“[illegible]”

[illegible]

[illegible]“[illegible]”[illegible]



[illegible]6–1 [illegible]

[illegible]Bathsheba Grossman

[illegible]x[illegible]y[illegible]z[illegible]x[illegible]y[illegible]z[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]x[illegible]y[illegible]z[illegible]

[illegible]x[illegible]y[illegible]z[illegible]

20[illegible]90[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]CAD[illegible]·[illegible]

[illegible]·[illegible]Moshe Shpitalni[illegible]CAD[illegible]

[illegible]“[illegible]”[illegible]400[illegible]2.5[illegible]

[illegible]20[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]



[illegible]6–2 [illegible]Autodesk Inventor[illegible]3D[illegible]
[illegible]Gonzalo Martinez, Autodesk

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]CAD

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]20[illegible]90[illegible]“[illegible]”[illegible]CAD[illegible]

[illegible]

[illegible]CAD[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]DNA[illegible]

[illegible]x[illegible]y[illegible]z[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]MP3[illegible]

[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]x[illegible]y[illegible]z[illegible]

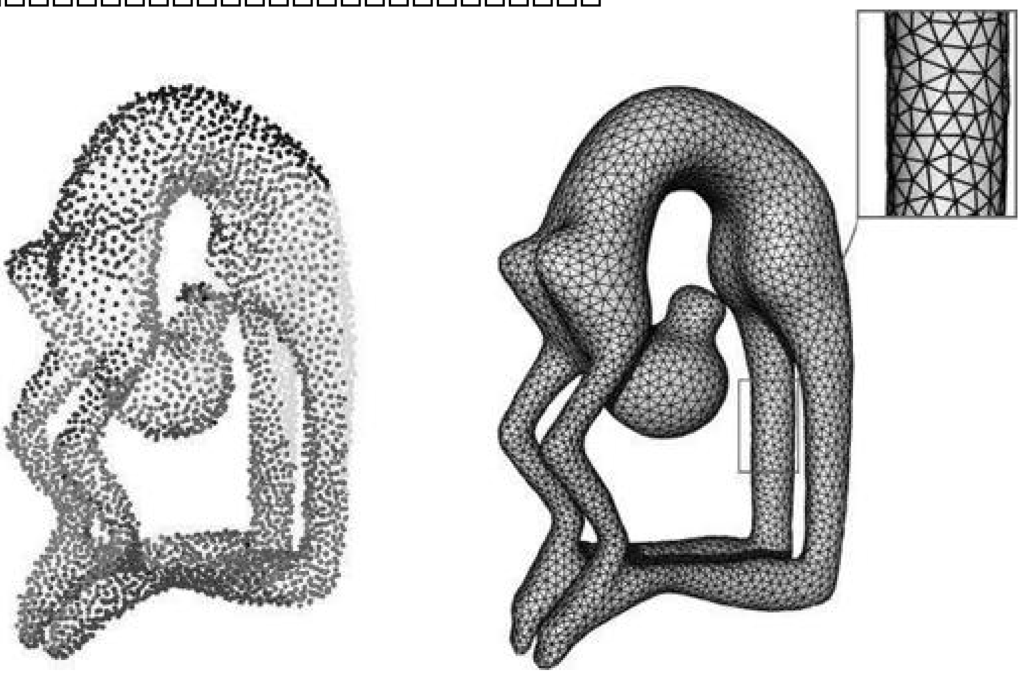
[illegible]x[illegible]y[illegible]z[illegible]

[illegible]“[illegible]”[illegible]

3D[illegible]3D[illegible]CAD[illegible]

[illegible]

[illegible]



[illegible]6–3 [illegible]

[illegible]Ligang Liu, Zhejiang University, China

[illegible]“[illegible]”[illegible]CT[illegible]X[illegible]

[illegible]

[illegible]—[illegible]3D[illegible]

3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]



[illegible]6–4 [illegible]CT[illegible]

[illegible]3D[illegible]STL[illegible]

[illegible]Daniel Dikovsky, Objet Inc.

3D[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]CAD[illegible]3D[illegible]3D[illegible]Materialise Magics[illegible]Netfabb[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]STL[illegible]ABC[illegible]·T·[illegible]STL[illegible]3D[illegible]STL[illegible]

STL[illegible]

[illegible]MP3[illegible]JPEG[illegible]

3D[illegible]STL[illegible]STL[illegible]20[illegible]80[illegible]3D[illegible]STL[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]STL[illegible]3D[illegible]STL[illegible]STL[illegible]3D[illegible]

30[illegible]STL[illegible]3D[illegible]3D[illegible]STL[illegible]3D[illegible]

[illegible]3D[illegible]1[illegible]STL[illegible]

[illegible]

[illegible]STL[illegible]XML[illegible]—AMF[illegible]AMF[illegible]3D[illegible]

[illegible]CAD[illegible]AMF[illegible]

AMF[illegible]STL[illegible]3D[illegible]AMF[illegible]STL[illegible]

2010[illegible]5[illegible]AMF[illegible]3D[illegible]CAD[illegible]3D[illegible]—STL[illegible]

[illegible]

[illegible]“[illegible]”[illegible]Autodesk[illegible]20[illegible]80[illegible]MicroCAD[illegible]Autodesk[illegible]123D[illegible]CAD[illegible]

[illegible]CAD[illegible]SolidWorks[illegible]PTC[illegible]SketchUp[illegible]99%[illegible]

“[illegible]”Autodesk[illegible]·[illegible]“[illegible]‘[illegible]’”

“[illegible]”[illegible]“[illegible]3D[illegible]”

[illegible]3D[illegible]“[illegible]11[illegible]3[illegible]”[illegible]

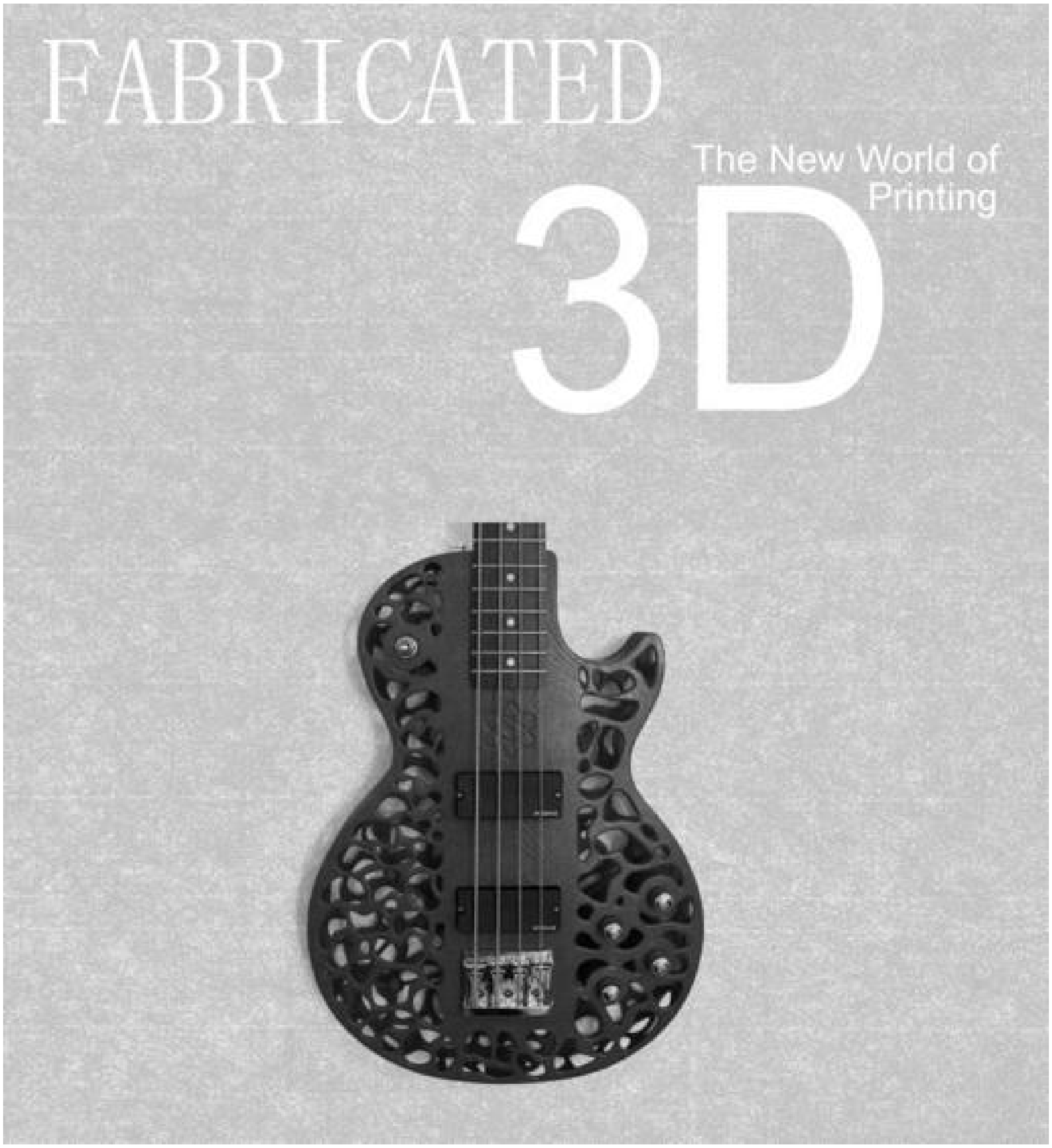


[illegible]6–5 [illegible]3D[illegible]123D Catch[illegible]

[illegible]Josh Mings

[illegible]“[illegible]”

[illegible]7[illegible] “[illegible]”[illegible]



[illegible]2011[illegible]TED[illegible]·[illegible]90%[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

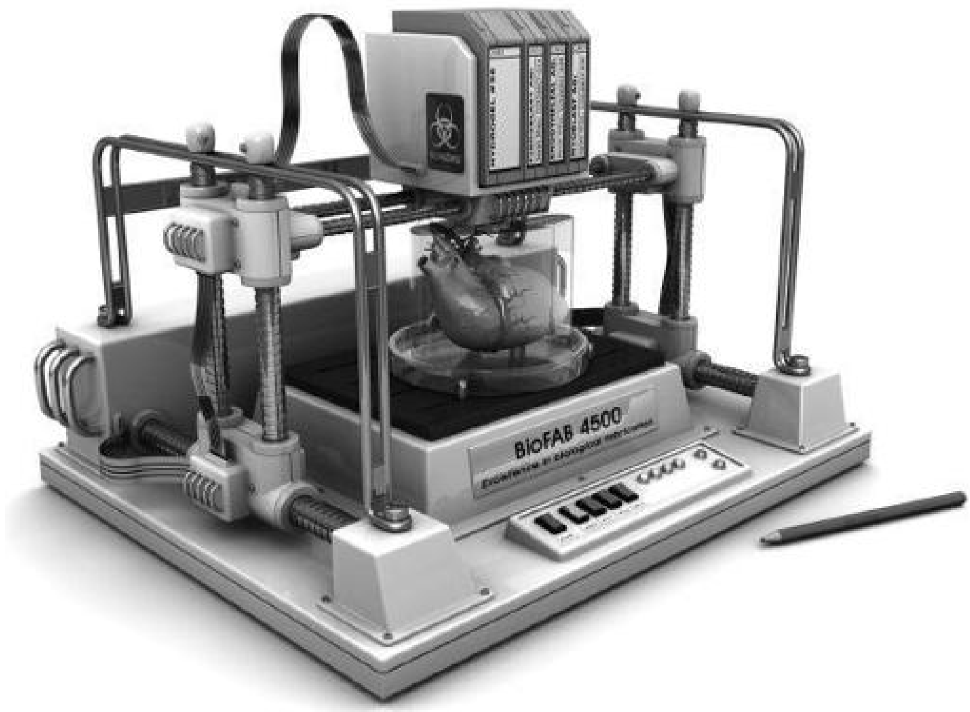
[illegible]TED[illegible]3D[illegible]“[illegible]—[illegible]”

3D[illegible]**20**[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]46[illegible]“[illegible]”[illegible]30[illegible]100[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]2072[illegible]



[illegible]7–1 [illegible]3D[illegible]

[illegible]Christopher Barnatt, ExplainingTheFuture.com

[illegible]3D[illegible]“3D[illegible]”[illegible]

[illegible]—[illegible]3D[illegible]

3D[illegible]

[illegible]·[illegible]“[illegible]3D[illegible]”[illegible]

[illegible]—[illegible]“[illegible]”[illegible]3D[illegible]—[illegible]3D[illegible]

[illegible]·[illegible]3D[illegible]Econolyst[illegible]“[illegible]3D[illegible]”[illegible]3D[illegible]3D[illegible]50[illegible]~75[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

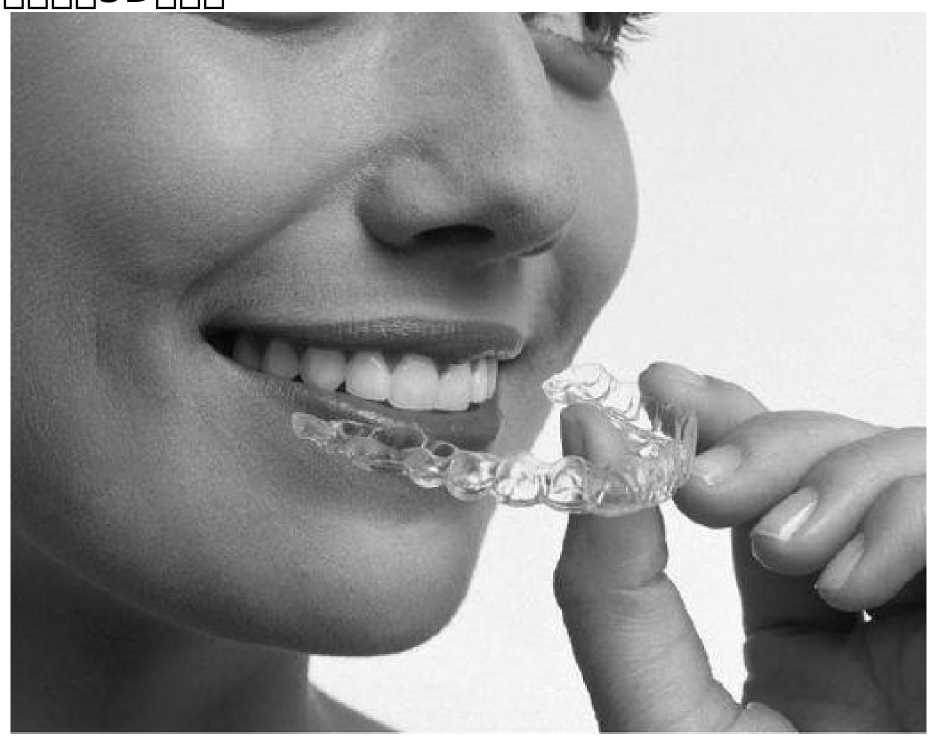


图7–2 [illegible]3D[illegible]5[illegible]

[illegible]Align Technology, Inc.

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

[…]—[…]Amputee Coalition[…]200[…]“[…]”[…]

[…]Bespoke Innovations[…]3D[…]3D[…]·[…]“[…]”

[…]3D[…]Bespoke[…]3D[…]

Bespoke[…]“[…]”[…]“[…]”[…]Bespoke[…]3D[…]



[…]7–3 […]

[…]3D Systems

Bespoke[…]Configurator[…]“fairings”[…]

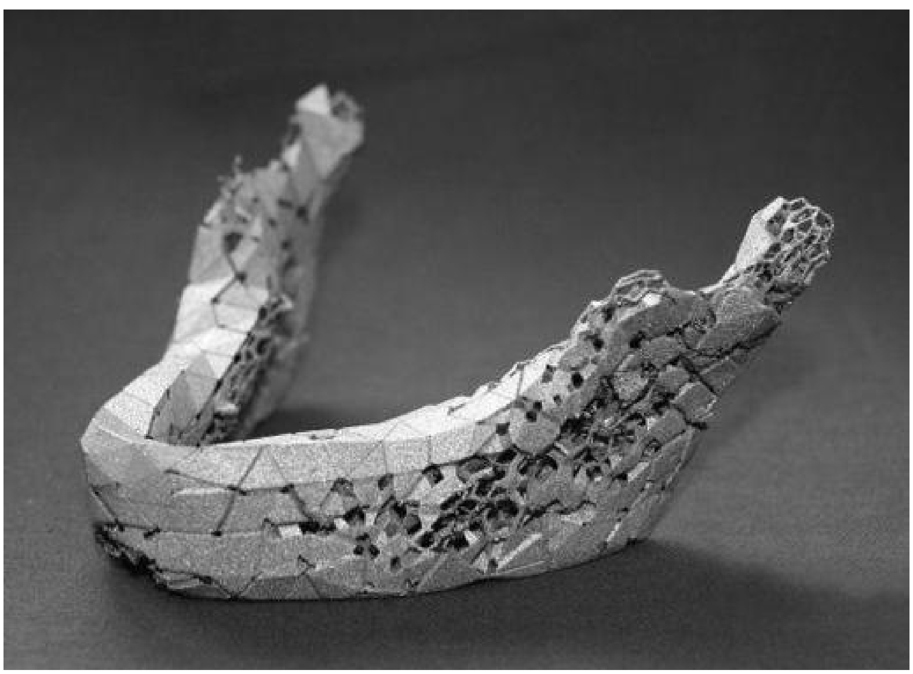
Bespoke[illegible]“Bespoke Fairings……[illegible]”[illegible]Bespoke[illegible]Bespoke[illegible]

[illegible]“3D[illegible]”[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

3D[illegible]3D[illegible]3D[illegible]

2012[illegible]3D[illegible]83[illegible]CT[illegible]Xilloc[illegible]CT[illegible]



[illegible]7–4 [illegible]“[illegible]”[illegible]

[illegible]Fraunhofer IFAM

[illegible]3D[illegible]LayerWise[illegible]3 000[illegible]

[illegible]3D[illegible]

“bionic”[illegible]“bios”[illegible]“electronic”[illegible]“onic”[illegible]20[illegible]70[illegible]·[illegible]“[illegible]”[illegible]the Bionic Man[illegible]“[illegible]”[illegible]the Bionic Woman[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]210[illegible]

20[illegible]80[illegible]

[illegible]3D[illegible]3D[illegible]4[illegible]

[illegible]9[illegible]

[illegible]3D[illegible]20[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“3D[illegible]”[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

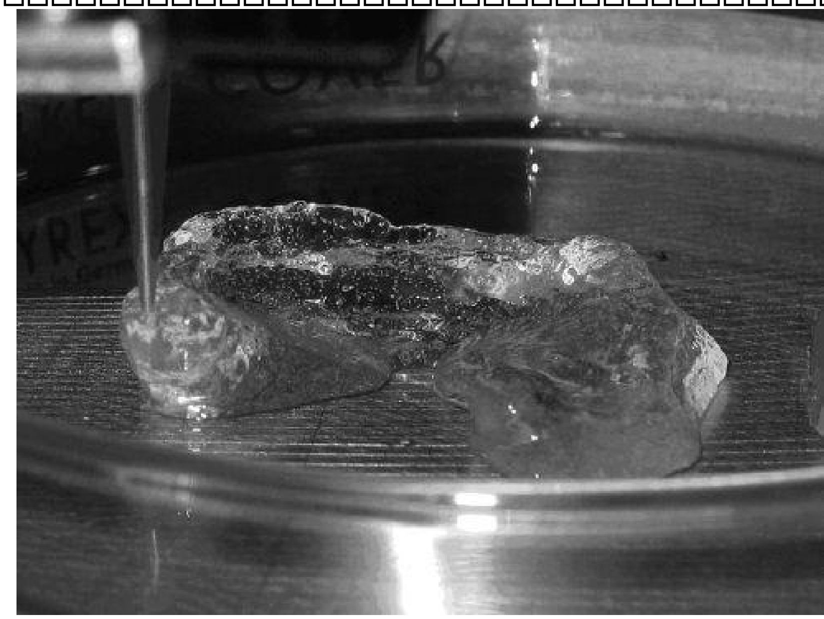
[illegible]“bioink particles”[illegible]“biopaper”[illegible]·[illegible]Gabor Forgacs[illegible]“[illegible]”

[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]



[illegible]7–5

[illegible]3D[illegible]“[illegible]”[illegible]CT[illegible]

[illegible]

[illegible]Daniel Cohen and Larry Bonassar

3D[illegible]·[illegible]·[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]50%[illegible]

[illegible]10[illegible]8 000[illegible]50[illegible]~60[illegible]

[illegible]500[illegible]

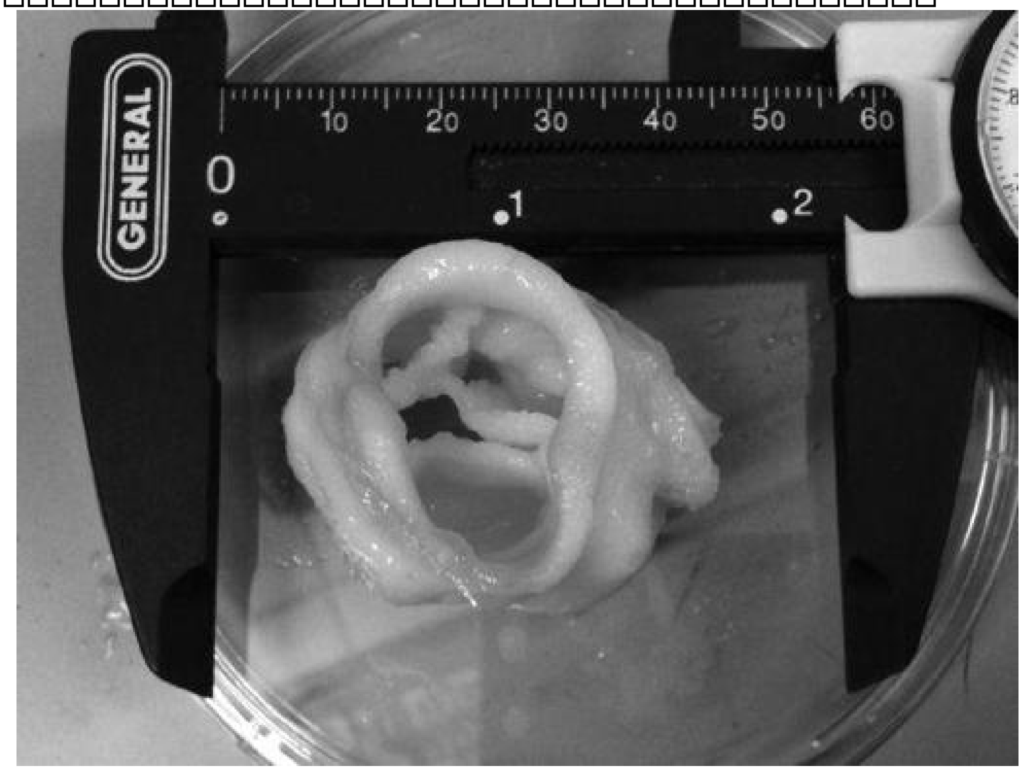
[illegible]10[illegible]25[illegible]

[illegible]3D[illegible]·[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”

[illegible]



[illegible]7–6　3D[illegible]

[illegible]Jonthan Butcher, Cornell University

[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”3D[illegible]Fab@Home[illegible]

[illegible]“[illegible]3D[illegible]3D[illegible]”

[illegible]“[illegible]”[illegible]“[illegible]”

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]CAD”[illegible]1.78[illegible]130[illegible]

[illegible]

[illegible]“[illegible]CAD”[illegible]—[illegible]·[illegible]·[illegible]·[illegible]·[illegible]*Pong*[illegible]

[illegible]1994[illegible]SCI[illegible]

[illegible]SCI[illegible]

[illegible]SCI[illegible]·[illegible]“[illegible]·[illegible]”—[illegible]“[illegible]”[illegible]SCI[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]CAD[illegible]”[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]SCI[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]CAD[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”

[illegible]·[illegible]“[illegible]38[illegible]”

[illegible]

[illegible]3D[illegible]CT[illegible]

[illegible]3D[illegible]

[illegible]X[illegible]

[illegible]MRI[illegible]PET[illegible]γ[illegible]γ[illegible]

[illegible]MRI[illegible]CT[illegible]CT[illegible]

[illegible]3D[illegible]

[illegible]—[illegible]—[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]50[illegible]UNOS[illegible]1%~2%[illegible]·[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]2004[illegible]“[illegible]3D[illegible]”[illegible]

[illegible]

> [illegible]—[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]·[illegible]“[illegible]

[illegible]”

[illegible]·[illegible]Yaser Shanjani[illegible]3D[illegible]“[illegible]3D[illegible]”[illegible]“3D[illegible]”[illegible]

[illegible]3D[illegible]“[illegible]”

[illegible]“[illegible]”

[illegible]

[illegible]3D[illegible]

3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

□□□□□□□□□□□□□□□“□□□□”□□□□□□□□□□□□□□□□□□
□□□□□



□7–7　□□□□□□□CT□□□□□
□□□□Objet Inc.



□7–8　□□□3D□□□□□□□□□□□□□□□□□

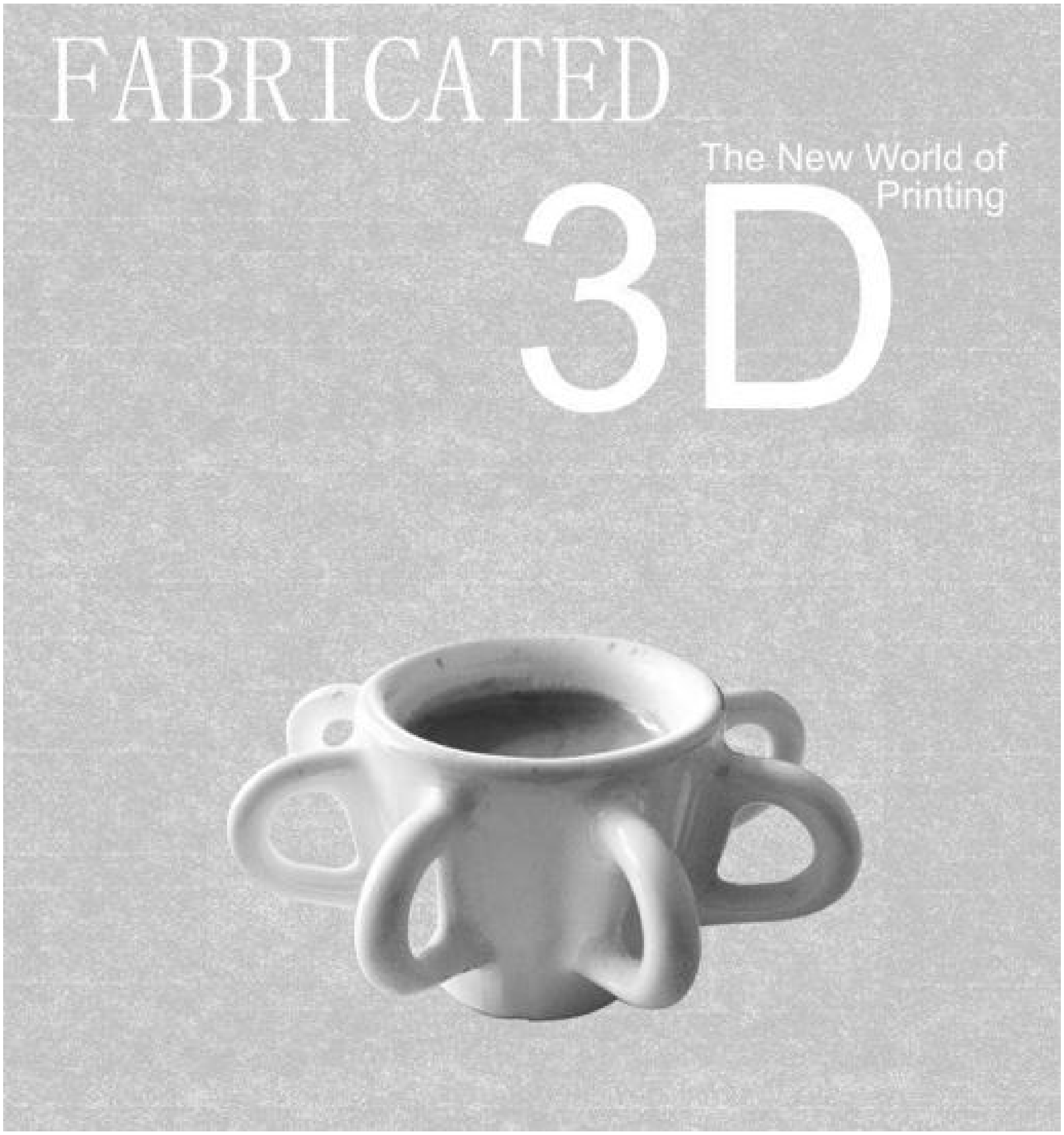
3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□

□□3D□□□□□□□□□□□□□□□□□□□100□□□□□□□□□□□
□□□100□□□□□□□□□□□□□□□□“□□□□”□□□□

□8□ 3D□□□□□□□□



□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□3D□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□Fab@Home□□□3D□□□□□□

“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]3D[illegible]……”

[illegible]“[illegible]”[illegible]—[illegible]

[illegible]Fab@Home[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

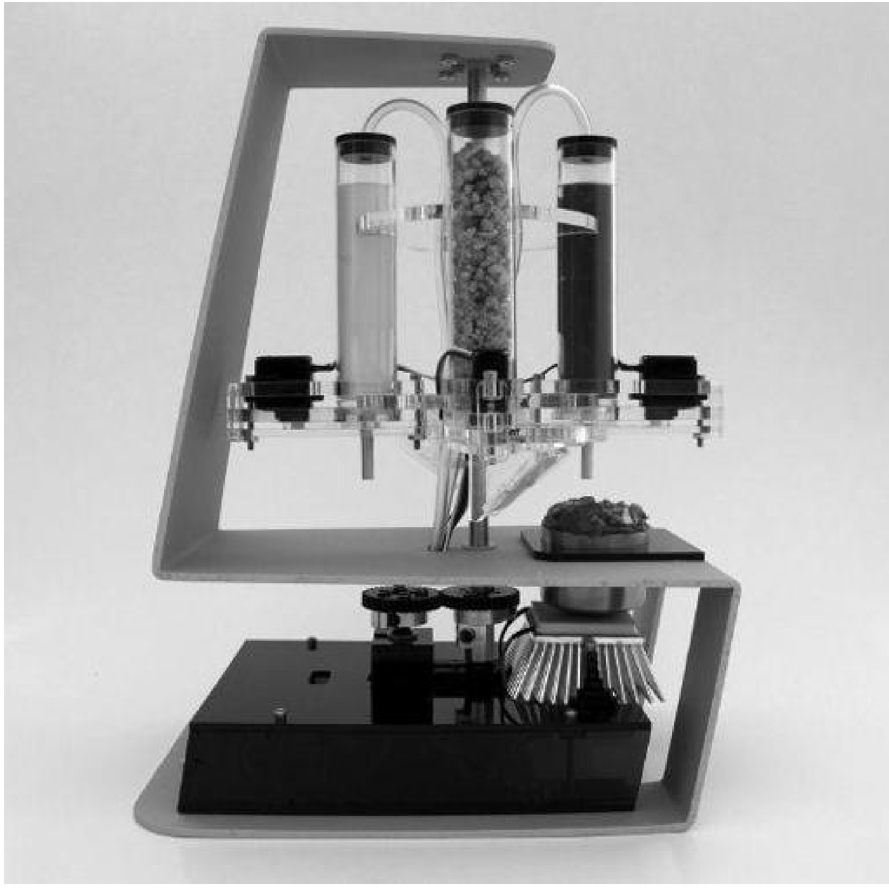
[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”—[illegible]

[illegible]“[illegible]”[illegible]·[illegible]·[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3D[illegible]

“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]



[illegible]8–1 [illegible]

[illegible]Marcelo Coelho

[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]



[illegible]8–2 [illegible]

[illegible]Marcelo Coelho and Amit Zoran

[illegible]

[illegible]

[illegible]Fab@Home[illegible]3D[illegible]

[illegible]3D[illegible]Fab@Home[illegible]3D[illegible]Fab@Home[illegible]·[illegible]2006[illegible]Fab@Home[illegible]·[illegible]Fab@Home[illegible]



[illegible]8–3 [illegible]·[illegible]2006[illegible]

[illegible]·[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]CAD”[illegible]

RepRap[illegible]3D[illegible]MakerBot[illegible]3D[illegible]

[illegible]

[illegible]MakerBot[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]100[illegible]/[illegible]“[illegible]100[illegible]/[illegible]”[illegible]

[illegible]

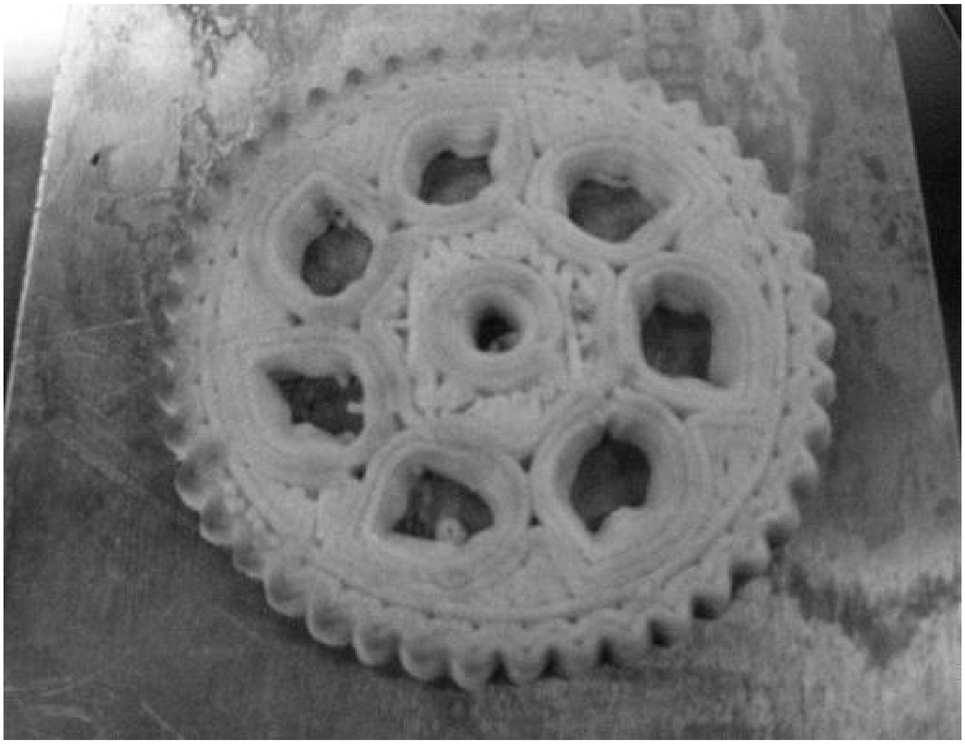
[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

3D[illegible]3D[illegible]·[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]



□8–4　□□□□□□□□3D□□□□□□

□□□□□Jason Bowman, University of Washington

□□“□□□1/4□□□□□□□□□□□□□□□□□□□□□”□□□

□□□

□□□“□□”□□□□□□□□□□□□

“□□□□□□□□□□□□□□□□□□□□”□□□□□□“□□□”□□□□□□□□□□□□□□□□□—□□□□MakerBot□□Frostruder□□□□□□□RepRap Prusa□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□3D□□□□□□□□

1□□□

1/2□□□

□□□□

1□□□□

1/2[illegible]

1[illegible]

1/4~1/2[illegible]

[illegible]50[illegible]10~15[illegible]

[illegible]177[illegible]7~12[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

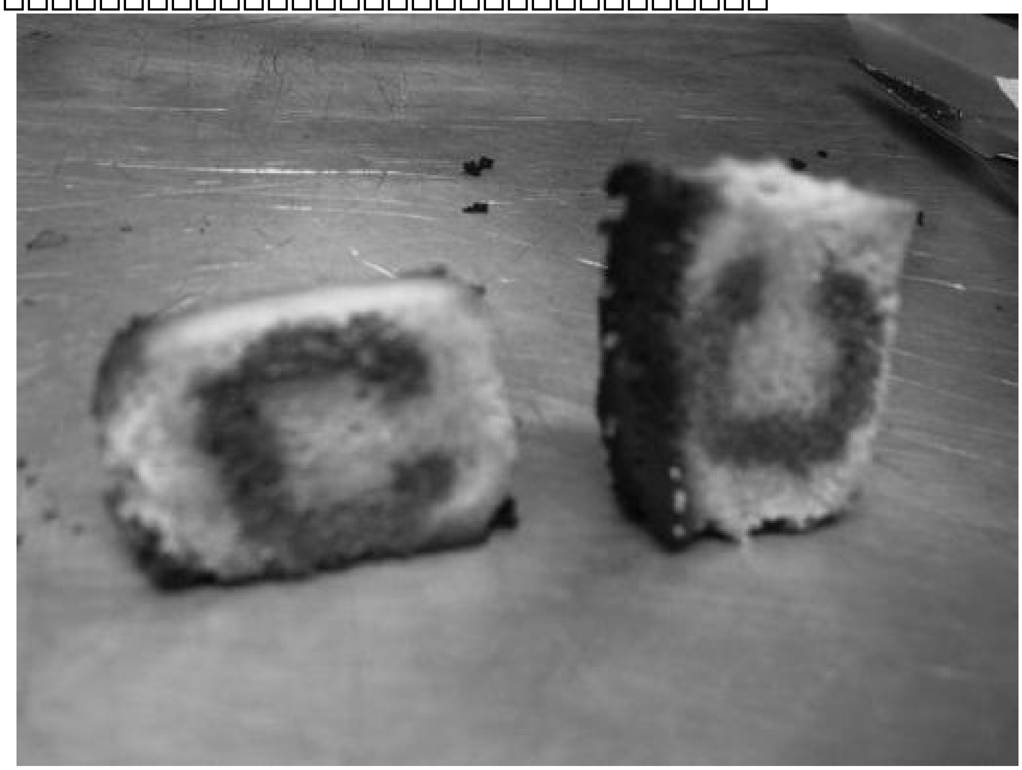
[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]·[illegible]

[illegible]3D[illegible]



[illegible]8–5 [illegible]“C”[illegible]3D[illegible]

[illegible]Jeffrey Lipton and Franz Nigl

[illegible] Fab@Home [illegible] CAD [illegible] “[illegible]” [illegible]

[illegible] · [illegible] CAD [illegible] Fab@Home [illegible] 28 [illegible]

[illegible] “[illegible]” [illegible] “C” [illegible]

[illegible] IT [illegible]

[illegible]

[illegible] — “[illegible]” [illegible] · [illegible] · [illegible] CandyFab [illegible] 3D [illegible]

[illegible] 3D [illegible] CandyFab [illegible] “[illegible]” [illegible] CandyFab [illegible] CandyFab [illegible]

[illegible] CandyFab [illegible] 10 [illegible] “[illegible]” [illegible]



[illegible]8–6 [illegible]3D[illegible]

[illegible]Windell H. Oskay, www.evilmadscientist.com

[illegible]CandyFab[illegible]“[illegible]”[illegible]

[illegible]

[illegible]DNA[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]·[illegible]“[illegible]”

[illegible]“[illegible]”

[illegible]DNA[illegible]

[illegible]3D[illegible]3D[illegible]GPS[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

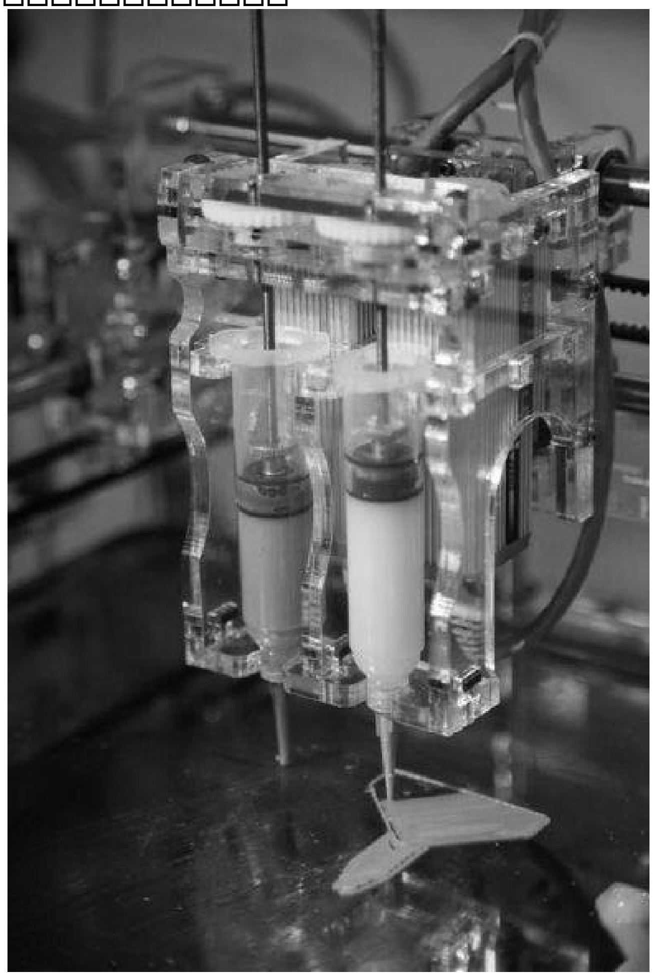
[illegible]“[illegible]”[illegible]

[illegible]7[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]20[illegible]“[illegible]”



[illegible]8–7 [illegible]

[illegible]Daniel Cohen and Chef Dave Arnold, French Culinary Institute, New York

[illegible]

[illegible]·[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”



[illegible]8–8 3D[illegible]

[illegible]Daniel Cohen and Chef Dave Arnold, French Culinary Institute, New York

[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]—[illegible]



8–9

Cohen, Lipton, Cutler, Coulter, Vesco, Cornell University

· ·

“ ”

B 80% 1 000 “ ”

· “ ” 3D

[illegible]

[illegible]

[illegible]



[illegible]8–10   3D[illegible]

[illegible]Jeffrey Lipton, Cornell University

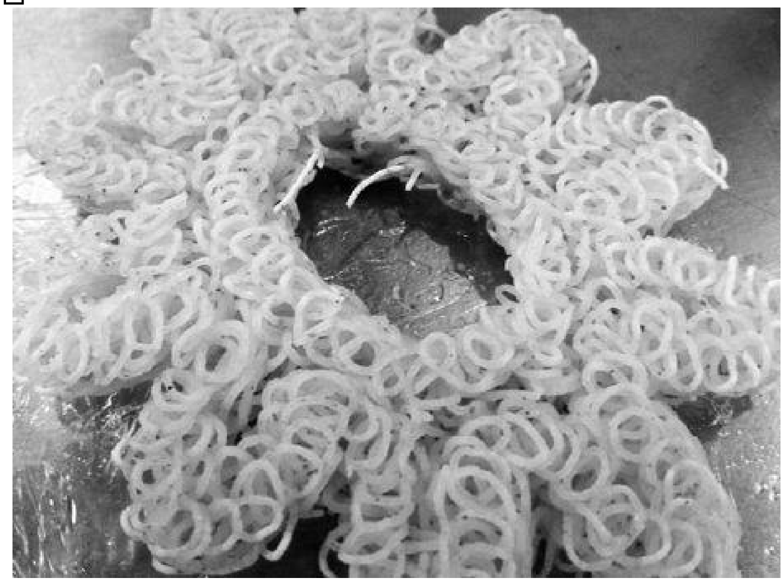
[illegible]3D[illegible]

[illegible]

3D[illegible]

3D[illegible]

[illegible]“[illegible]”[illegible]

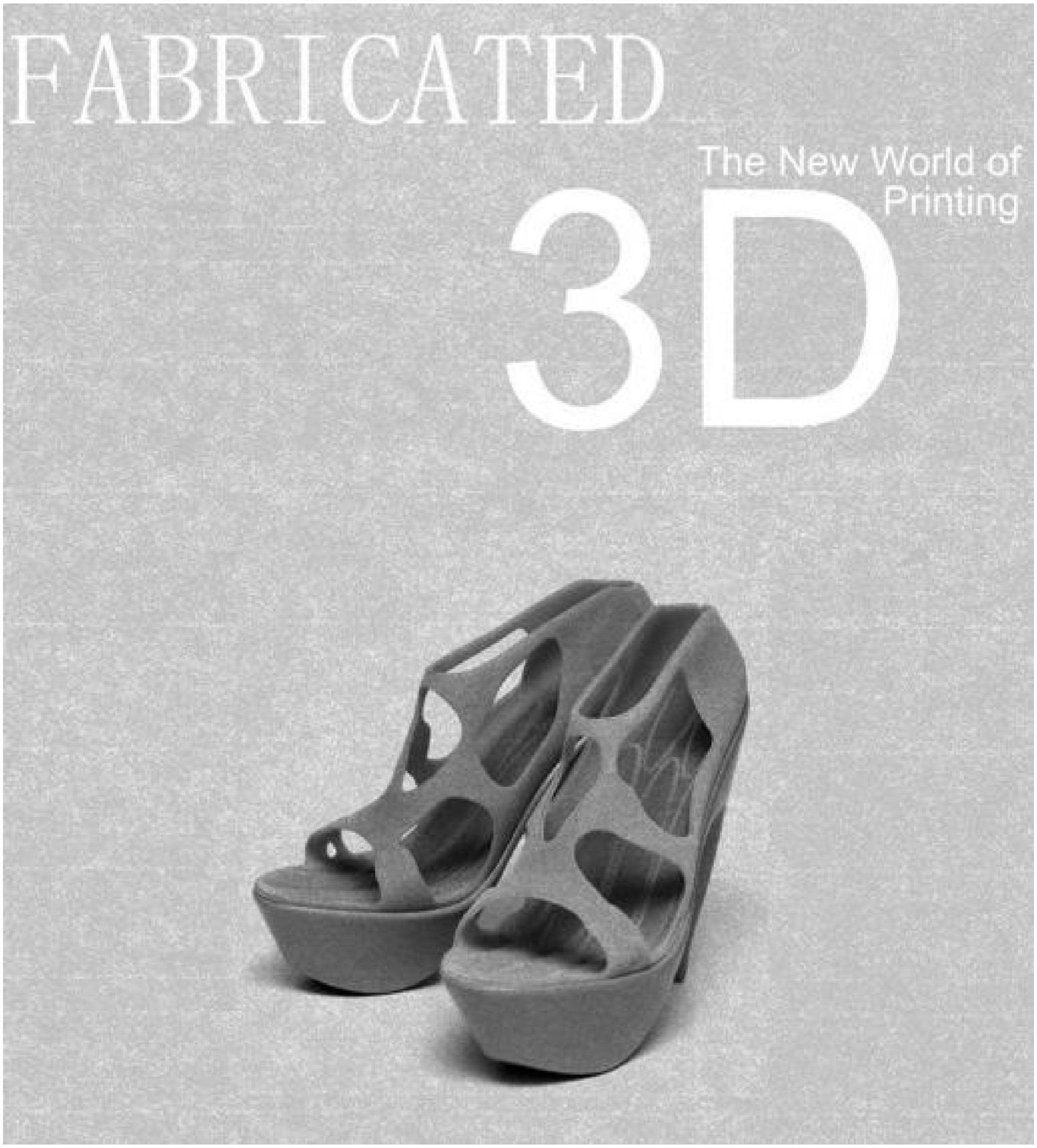


[illegible]8–11 [illegible]

[illegible]Jeffrey Lipton and Chef Dave Arnold

[illegible]3D[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]9[illegible] [illegible]3D[illegible]



[illegible]3D[illegible]“[illegible]”[illegible]·[illegible]“[illegible]”

[illegible]3D[illegible]
3D[illegible]

[illegible]3D[illegible]

[illegible]Fab@Home[illegible]Fab@Home[illegible]3D[illegible]3D[illegible]3[illegible]

[illegible]Fab@Home[illegible]“[illegible]”[illegible]Fab@Home[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]5[illegible]

[illegible]·[illegible]“[illegible]”

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]Fab@school[illegible]Fab@school[illegible]3D[illegible]·[illegible]

[illegible]350[illegible]10[illegible]



[illegible]9–1 [illegible]Fab@Home[illegible]

[illegible]

[illegible]Glen Bull University of Virginia

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]20[illegible]“[illegible]”[illegible]Fab@Home[illegible]

[illegible]

> [illegible]iPod[illegible]

[illegible]

> [illegible]70[illegible]1/4[illegible]15[illegible]

[illegible]“[illegible]”[illegible]

□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□
□□□
□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□□□”□□□□
□□□□“□□□□”□□□□□□□□□□□□□□“□□□□□□□□□□□□□□”□

□□□□□□□□□□□□□□□□□□□□□□□□RPM□□□□□□□□□□□□□□
□“□□□□□□□□□□□□”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□



□9–2 □□□□□□□□□□□□□□3D□□□□

□□□□Glen Bull University of Virginia

□□□□□□Fab@school□□□□□□□□□□□·□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□”

Fab@school□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□“□□□□”□□□□□
Fab@school□□□□□□

□□□□□□□□

3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□

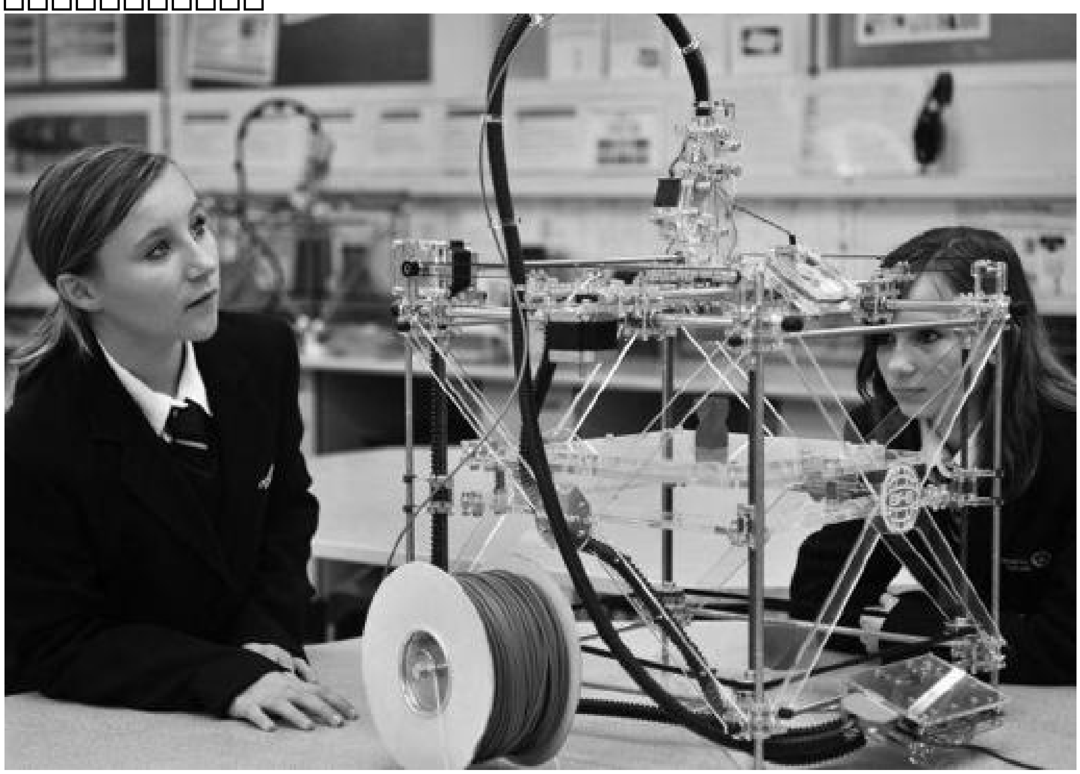
[illegible]

[illegible]3D[illegible]3D[illegible]Stratasys[illegible]·[illegible]Stratasys[illegible]3D[illegible]

[illegible]Stratasys[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]·[illegible]25[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]



[illegible]9–3 [illegible]RapMan 3D[illegible]

[illegible]Dave White, United Kingdom

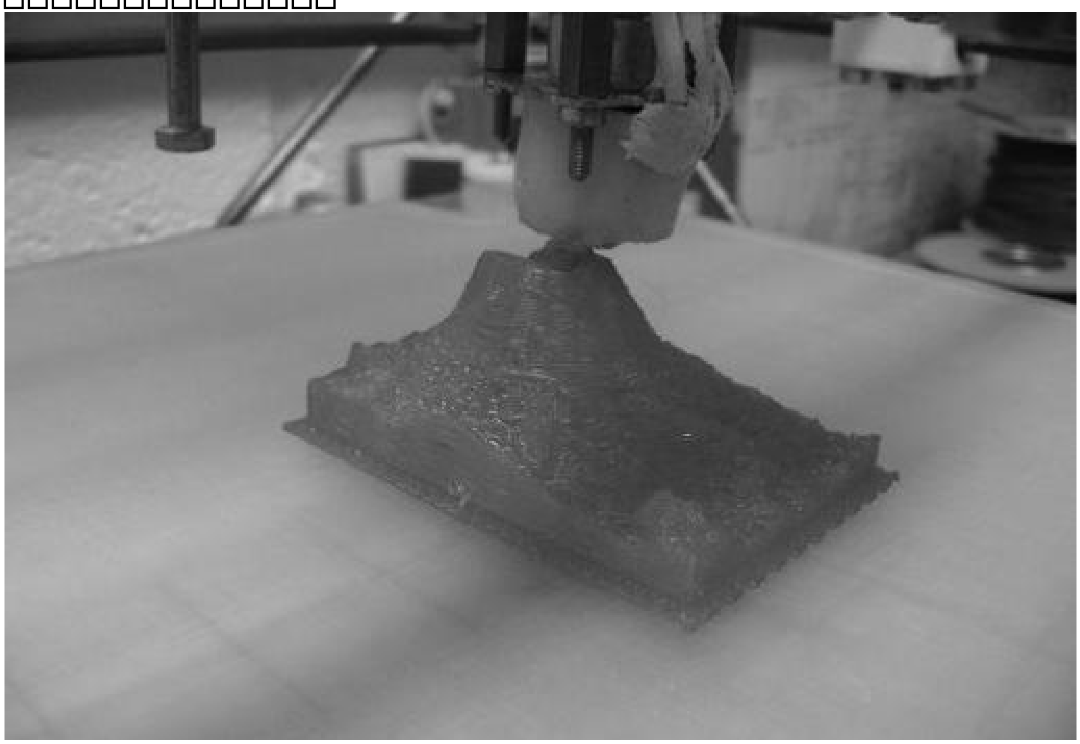
[illegible]3D[illegible]“[illegible]”

[illegible]iPod[illegible]“[illegible]iPod[illegible]”[illegible]

[illegible]“[illegible]”

[illegible]3D[illegible]3D[illegible]DNA[illegible]

[illegible]1980[illegible]“[illegible]”



[illegible]9–4 [illegible]3D[illegible]

[illegible]Dave White, United Kingdom

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]·[illegible]3D[illegible]“[illegible]”[illegible]RapMan 3D[illegible]

[illegible]“[illegible]”

[illegible]

[illegible]STEM[illegible]20[illegible]50[illegible]2[illegible]30[illegible]

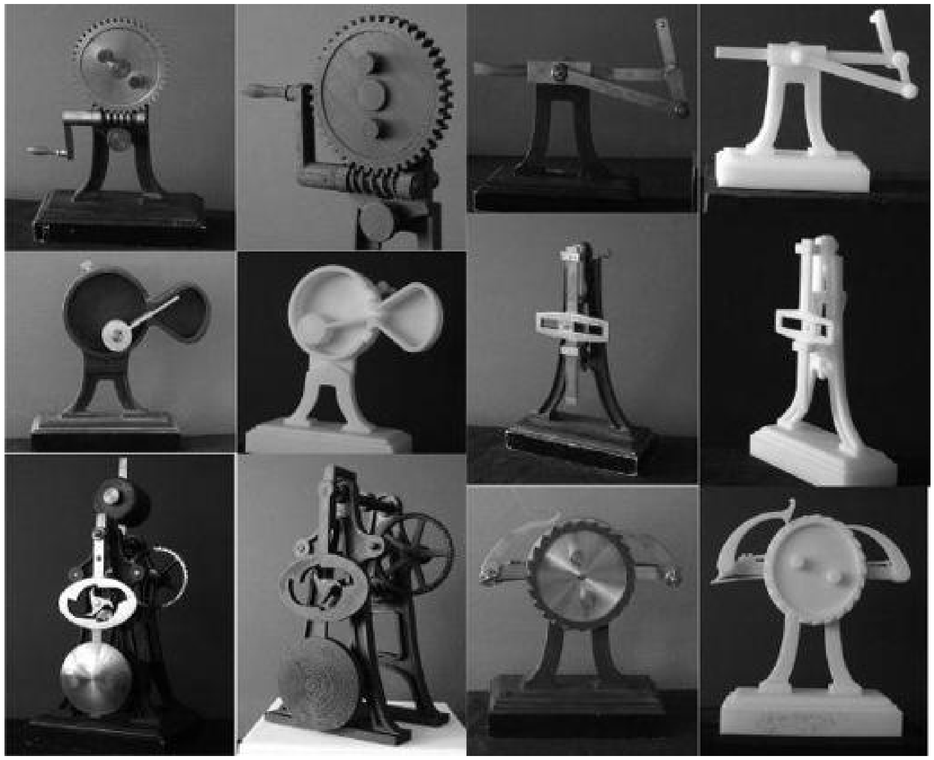
[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]STEM[illegible]STEM[illegible]3D[illegible]STEM[illegible]3D[illegible]

[illegible]3D[illegible]STEM[illegible]3D[illegible]

[illegible]3D[illegible]STEM[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]



[illegible]9–5 [illegible]19[illegible]3D[illegible]
[illegible]kmoddl.library.cornell.edu

[illegible]

[illegible]·[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]“[illegible]”[illegible]“[illegible]”

[illegible]·[illegible]“[illegible]”

[illegible]·[illegible]1995[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]70[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]K–12[illegible]12[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

3D[illegible]

[illegible]3D[illegible]

[illegible]Fab@school[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]10[illegible]

[illegible]$y=1/x$[illegible]

[illegible]x[illegible]x[illegible]y[illegible]y[illegible]2[illegible]x[illegible]1/2[illegible]

[illegible]MBA[illegible]GRE[illegible]

[illegible]

[illegible]

[illegible]Fab@school[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]·[illegible]

[illegible]P–V–T[illegible]–[illegible]–[illegible]·[illegible]P–V–T[illegible]30[illegible]P–V–T[illegible]10[illegible]15[illegible]“[illegible]”[illegible]



[illegible]9–6 [illegible]3D[illegible]

[illegible]Glen Bull, University of Virginia

[illegible]30[illegible]

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□



□9–7 □□PVT□□□□□□□□□□3D□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□3D□□□□□□□□□□□□3D□□□□□□□□□□□□□
□□□□□□□□□□

3D□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□
□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□3D□□

□□□3D□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□
□□□□□□□3D□□□□□□□□□□□□□3D□□□□3D□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□

□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□



[illegible]9–8

[illegible]MakerBot[illegible]K–12[illegible]

[illegible]“[illegible]”[illegible]

[illegible]Ryan Cain

[illegible]FDA[illegible]

“[illegible]”[illegible]3D[illegible]

3D[illegible]

3D[illegible]3D[illegible]

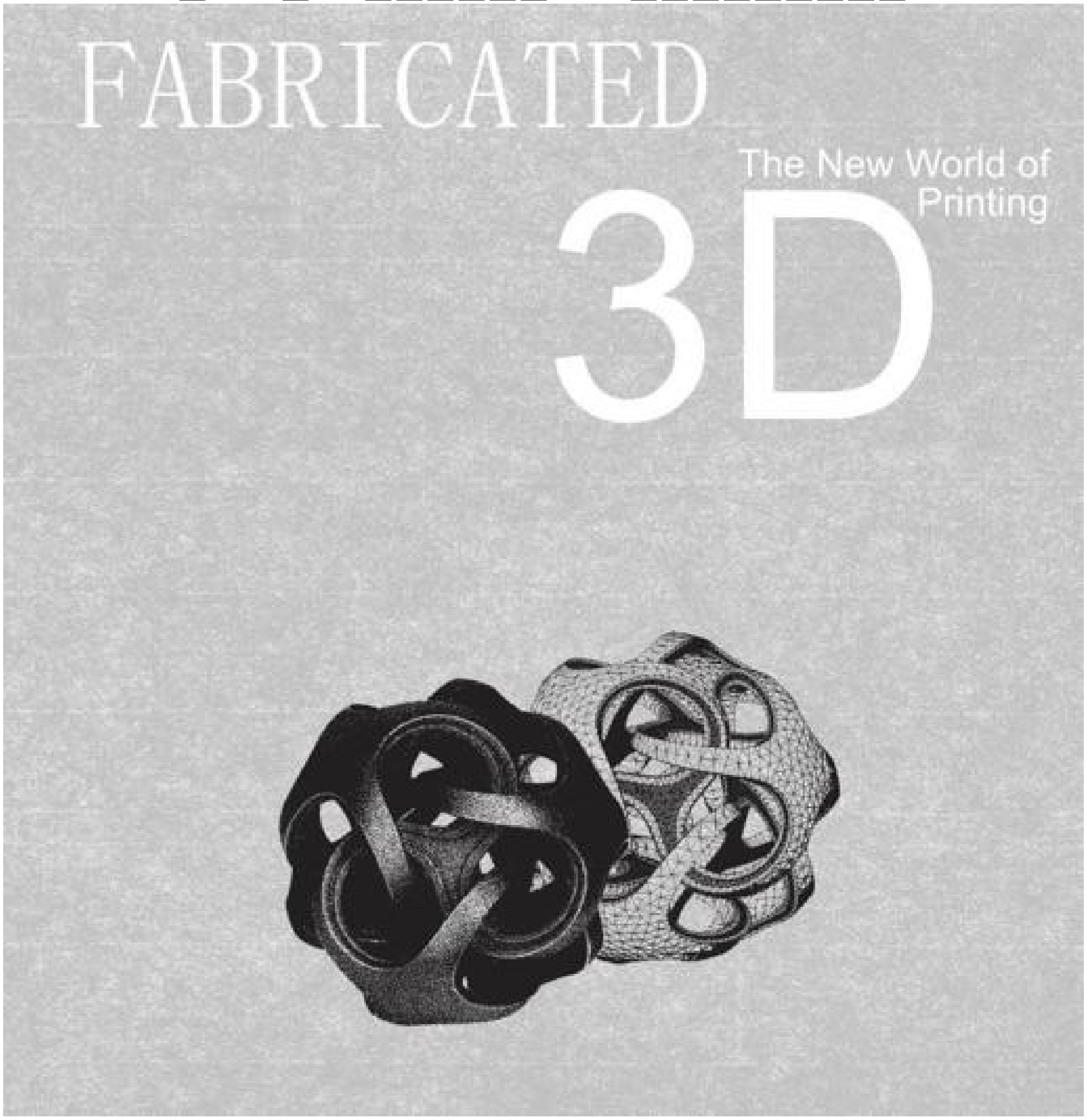
[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]K–12[illegible]3D[illegible]

[illegible]3D[illegible]K–12[illegible]K–12[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

3D[illegible]3D[illegible]3D[illegible]3D[illegible]


FABRICATED
The New World of
Printing
3D

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]1[illegible]1[illegible]2[illegible]3[illegible]5[illegible]8[illegible]13[illegible]21……[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]Fractal–T[illegible]T[illegible]·[illegible]·[illegible]·[illegible]3D[illegible]3D[illegible]“[illegible]”Fractal–T[illegible]3D[illegible]“[illegible]Fractal–T”[illegible]



[illegible]10–1 [illegible]
[illegible]MGX, a division of Materialise. Designed by Gernot Oberfell, Jan Wertel, and Matthias Bär.

Fractal–T[illegible]Fractal–T[illegible]

[illegible]Shapeways[illegible]3D[illegible]3D[illegible]

[illegible]·[illegible]3D[illegible]

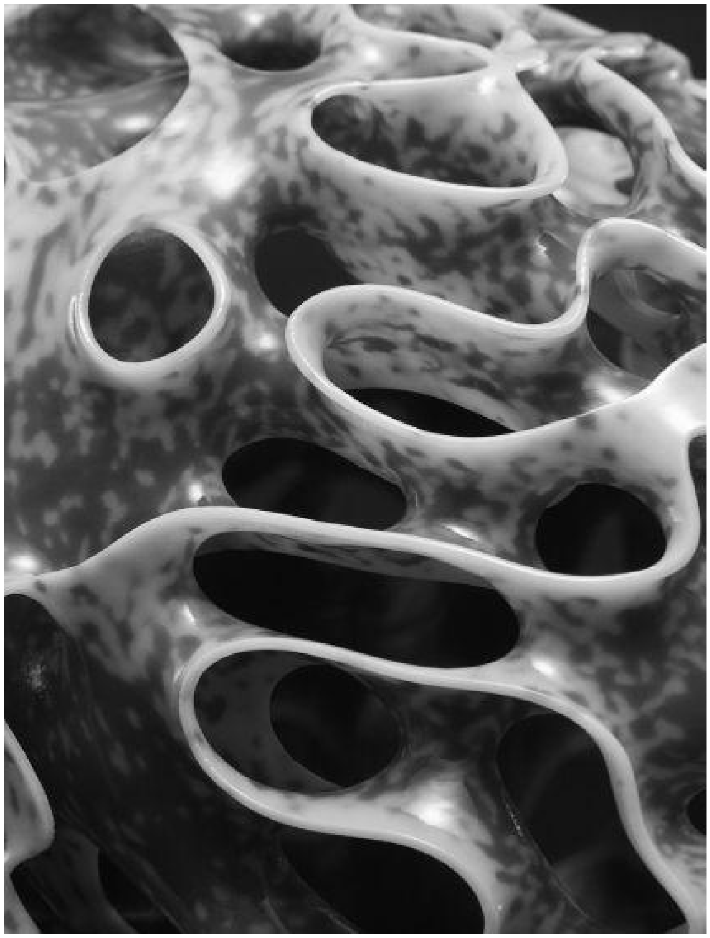


[illegible]10–2 [illegible]3D[illegible]“[illegible]”[illegible]

[illegible]Bathsheba Grossman

[illegible]:“[illegible]”[illegible]3D[illegible]

[illegible]Unellenu[illegible]3D[illegible]100[illegible]Shapeways[illegible]



[illegible]10–3

[illegible]·[illegible]3D[illegible]

[illegible]Neri Oxman, W.Carter (MIT), Joe Hicklin (The Mathworks), Centre Pompidou, Paris, France, Photo: Yoram Reshef

[illegible]·[illegible]·[illegible]–[illegible]2007[illegible]3D[illegible]

[illegible]·[illegible]1[illegible]0[illegible]Kickstarter[illegible]“[illegible]”[illegible]3D[illegible]“‘60’[illegible]”[illegible]“[illegible]”

[illegible]3D[illegible]“[illegible]”[illegible]2008[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]”

[illegible]—[illegible]3D[illegible]“[illegible]”[illegible]Knots & Tangles[illegible]

“[illegible]”[illegible]“[illegible]”

[illegible]·[illegible]Eyal Gever[illegible]“[illegible]”[illegible]3D[illegible]



[illegible]10–4 [illegible]

[illegible]“[illegible]”[illegible]

[illegible]Eyal Gever

www.eyalgever.com

3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]·[illegible]3D[illegible]3D[illegible]Within Technologies[illegible]

[illegible]3D[illegible]“[illegible]”

[illegible]·[illegible]

[illegible]Within Technologies[illegible]Within Technologies[illegible]



[illegible]10–5

[illegible]·[illegible]3D[illegible]Within Technologies[illegible]

[illegible]Ross Barber

[illegible]3D[illegible]3D[illegible]

[illegible]Within Technologies[illegible]

Within Technologies[illegible]·[illegible]Within Technologies[illegible]

[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]Hoon Chung[illegible]



[illegible]10–6 [illegible]3D[illegible]

[illegible]Hoon Chung

[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]



[illegible]10–7 [illegible]

[illegible]Continuum Fashion[illegible]·[illegible]3D[illegible]

[illegible]Jenna Fizel and Mary Huang, Continuum Fashion

[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]·[illegible]“[illegible]”[illegible]“[illegible]”

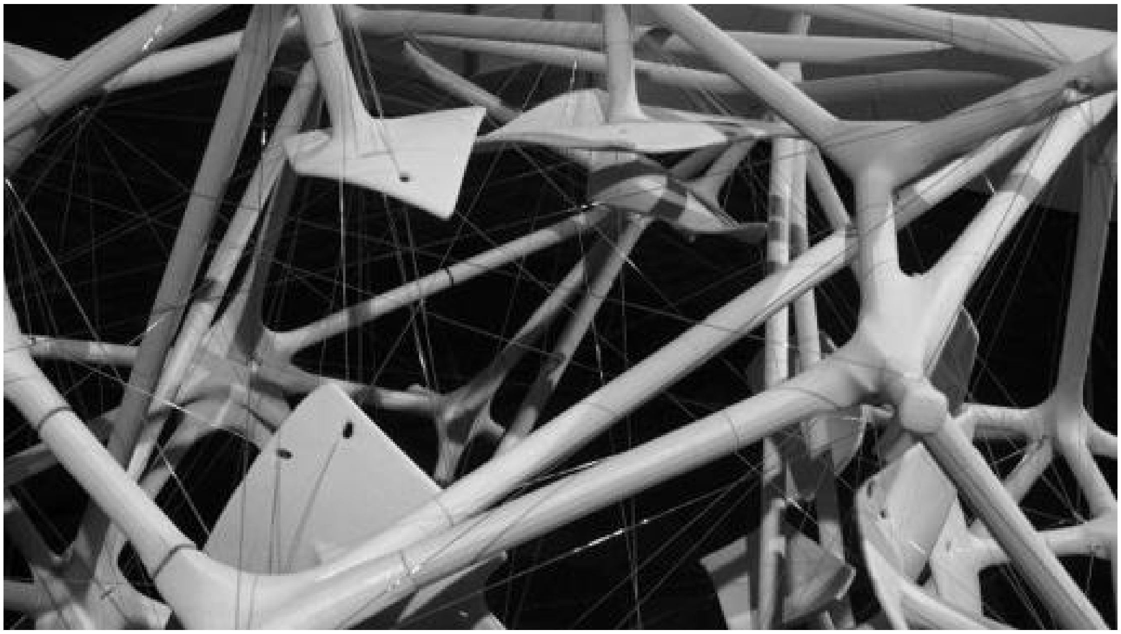
[illegible]6[illegible]3D[illegible]“[illegible]”

[illegible]—[illegible]eSkin[illegible]3D[illegible]

“[illegible]”[illegible]“[illegible]”[illegible]—[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]



[illegible]10–8 [illegible]3D[illegible]

[illegible]Jenny Sabin

[illegible]·[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]

[illegible]2010[illegible]·[illegible]TED[illegible]“[illegible]38[illegible]”

[illegible]

[illegible]3D[illegible]

[illegible]·[illegible]

[illegible]·[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]20[illegible]70[illegible]·[illegible]20[illegible]50[illegible]

[illegible]5[illegible]“[illegible]”[illegible]“[illegible]3D[illegible]”

“[illegible]”

“[illegible]”[illegible]“[illegible]3D[illegible]”

“[illegible]3D[illegible]”[illegible]“[illegible]—[illegible]”

“[illegible]”[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]3D[illegible]”[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]5~10[illegible]

[illegible]3D[illegible]3D[illegible]

Fabbaloo[illegible]3D[illegible]3D[illegible]“[illegible]—[illegible]”

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]*Txchnologist*[illegible]·[illegible]2 800[illegible][1][illegible]6[illegible]6[illegible]

3D[illegible]·[illegible]“[illegible]”

[illegible]3D[illegible]

3D[illegible]3D[illegible]3D[illegible]

[illegible]·[illegible]

[illegible]“[illegible]”3D[illegible]

[illegible]7[illegible][2][illegible]23[illegible]15[illegible]20[illegible]1[illegible]



[illegible]10–9 [illegible]

[illegible]Behrokh Khoshnevis Center for Rabid Automated Fabrication Technologies(CRAFT) at the University of Southern California

[illegible]“[illegible]”[illegible]

[illegible]·[illegible]“[illegible]”[illegible]

[illegible]·[illegible]3D[illegible]“D[illegible]”[illegible]D[illegible]

D[illegible]4[illegible]1[illegible]

[illegible]D[illegible]3D[illegible]



[illegible]10–10

[illegible]·[illegible]

[illegible]Enrico Dini and Andrea Morgante

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]



[illegible]10–11

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]Sungwoo Lim and Richard Buswell. Photo: Agnese Sanvito

[illegible]3D[illegible]3D[illegible]—“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]·[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

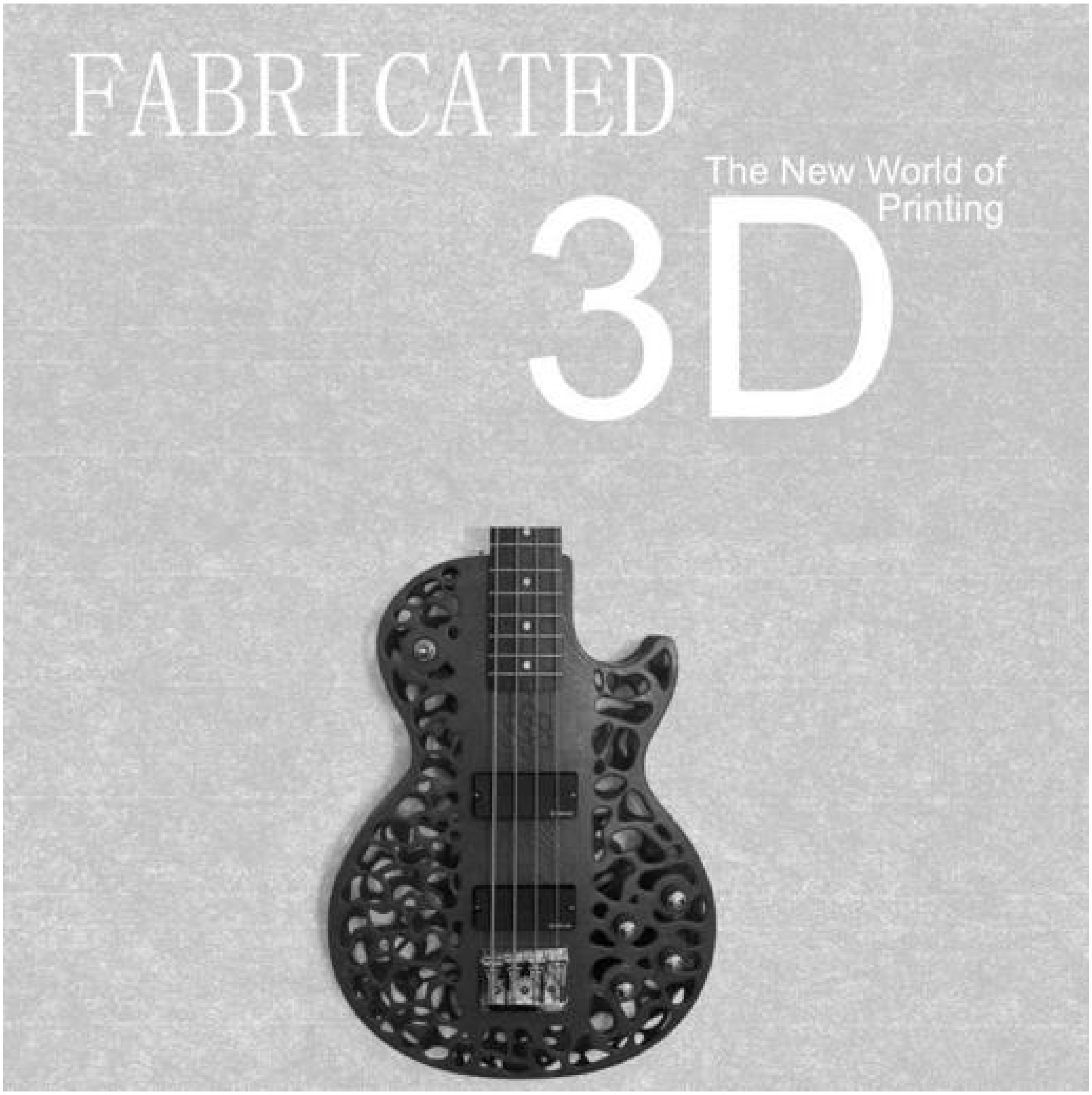
□□□□□□□□□□□□□□□□□□□□□□□

□□□□

(1) 1□□□□≈0.09□□□□

(2) 1□□≈30.48□□□

[illegible]11[illegible] 3D[illegible]



[illegible]

[illegible]

[illegible]

[illegible]

[illegible]1 500[illegible]



[illegible]11–1

[illegible]·[illegible]3D[illegible]

[illegible]Markus Kayser

[illegible]

[illegible]

[illegible]·[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]“[illegible]3D[illegible]”[illegible]

[illegible]“[illegible]”[illegible] —[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]

3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]80%[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]—[illegible]

[illegible]3D[illegible]—[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]10[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

“[illegible]”[illegible]·[illegible]“[illegible]”[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]10[illegible]3D[illegible]65%[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]40%[illegible]60%[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]90%[illegible]1[illegible]15[illegible]

[illegible]3D[illegible]3D[illegible]

3D[illegible]3D[illegible]“[illegible]”[illegible]

□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□1□□□□□□□□□□□□600□□



□11–2

□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□

□□□□：www.paulmcmullin.com. Designed by EADS, UK

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□

□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□

□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□20□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□80%□□□□□
□□□□□□□□□

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

3D[illegible]

3D[illegible]

3D[illegible]

[illegible]MakerBot[illegible]2012[illegible]ABS[illegible]MakerBot[illegible]3D[illegible]“ABS[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]2000[illegible]1960[illegible]25[illegible]

[illegible]·[illegible]“[illegible]”[illegible]150[illegible]1976[illegible]

[illegible]

[illegible]

1997[illegible]·[illegible]“[illegible]”[illegible]

[illegible]*Plastic Ocean*[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]6[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]

3D[illegible]·[illegible]3D[illegible]—[illegible]“[illegible]……[illegible]……[illegible]”

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]“[illegible]”[illegible]·[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]WOOF[illegible]

WOOF[illegible]40[illegible][1][illegible]·[illegible]2%[illegible]WOOF[illegible]150[illegible]



[illegible]11–3 [illegible]

[illegible]Mark Ganter and Duane Storti, Solheim Lab, University of Washington

WOOF[illegible]·[illegible]“[illegible]”[illegible]14[illegible]

[illegible]5[illegible]·[illegible]·[illegible]·[illegible]14[illegible]

[illegible]3D[illegible]13%[illegible]



[illegible]11–4 [illegible]3D[illegible]

[illegible]Brandon Bowman, Washington Open Objects Fabricators (WOOF) slub, and Mark Ganter and Duane Storti, Solheim Lab, University of Washington

[illegible]PLA[illegible]3D[illegible]PLA[illegible]3D[illegible]PLA[illegible]

[illegible]ABS[illegible]“[illegible]3D[illegible]”

[illegible]·[illegible]Kickstarter[illegible]1[illegible]3D[illegible]Filabot[illegible]“[illegible]……[illegible]Filabot[illegible]3D[illegible]”[illegible]

[illegible]“[illegible]3D[illegible]3D[illegible]”[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”

“[illegible]3D[illegible]”[illegible]

3D[illegible]

3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]20[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]



[illegible]11–5 [illegible]

[illegible]3D[illegible]3D[illegible]

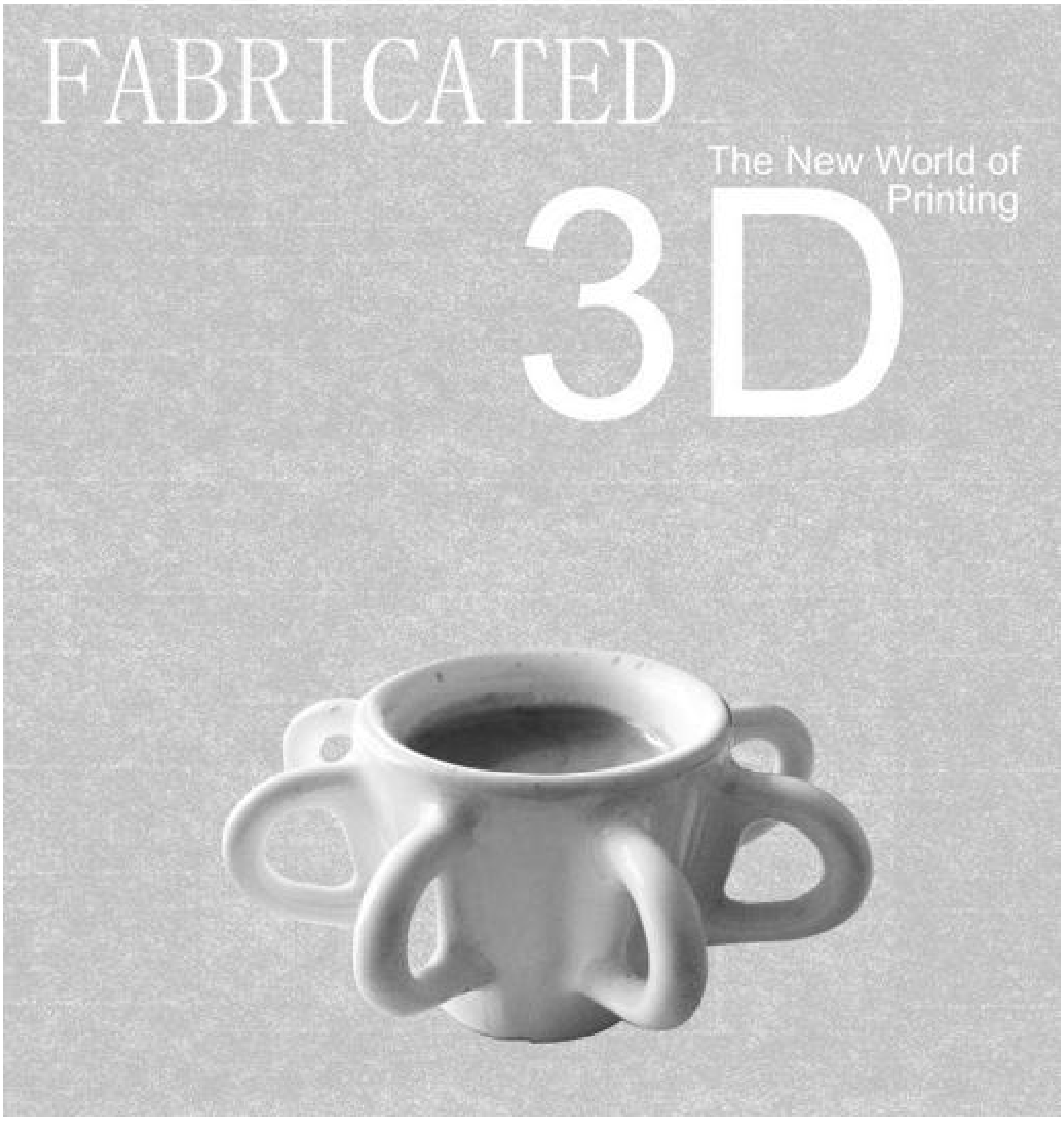
[illegible]3D[illegible]

3D[illegible]20[illegible]·[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

(1)1[illegible]=0.453 5[illegible]—[illegible]

[illegible]12[illegible] [illegible]



[illegible]3D[illegible]Shapeways[illegible]

[illegible]Shapeways[illegible]

[illegible]“[illegible]”[illegible]

iPhone[illegible]“[illegible]”[illegible]

[illegible]iPhone[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]10[illegible]

[illegible]VAT[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]1995[illegible]1/100[illegible]5[illegible]2000[illegible]

[illegible]3D[illegible]2012[illegible]Thingiverse.com[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]



□12–1 □3D□□□□□□□□□□22□□□□□

□□□□Michael Guslick

□□□□□□□□□Thingiverse□□□□□□□□□3D□□

□□□□□□□□□□□“Haveblue”□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□22□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

Haveblue□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□200□□□□□□□□□□□□□□□□□□□□□□□□□□Stratasys□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□30□□□□□□□□□□□□□□□

□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□3D□□□

□□□

□□□□□

□□□“□□□□□”

“□□□”□□□□“□□□□□□□□□□□□□□□□□□”

[illegible]·[illegible]·[illegible]3D[illegible]·[illegible]Fab@Home[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]·[illegible]“3D[illegible]”[illegible]

[illegible]DIY[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“[illegible]3D[illegible]”

3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]“torte”[illegible]“e”[illegible]“tort law”[illegible]

[illegible]80[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]

3D[illegible]3D[illegible]—[illegible]“[illegible]”

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

3D[illegible]

[illegible]

[illegible]“Napster[illegible]”[illegible]3D[illegible]“Napster[illegible]”[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]·[illegible]“[illegible]3D[illegible]”

[illegible]3D[illegible]

[illegible]3D[illegible]20[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]5[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]·[illegible]“‘[illegible]’[illegible]‘[illegible]’[illegible]”

[illegible]70[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

“[illegible]”[illegible]“patere”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]20[illegible]

[illegible]

3D[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]“[illegible]”

[illegible]DRM[illegible]DRM[illegible]iTunes[illegible]“[illegible]”[illegible]“[illegible]”[illegible]DRM[illegible]DRM[illegible]iBook[illegible]

[illegible]3D[illegible]2012[illegible]#8 286 236[illegible]3D[illegible]DRM[illegible]3D[illegible]DRM[illegible]

DRM[illegible]3D[illegible]DRM[illegible]·[illegible]·[illegible]·[illegible]“[illegible]”

[illegible]DRM[illegible]FSF[illegible]“RYF”[illegible]FSF[illegible]RFY[illegible]“[illegible]”[illegible]Aleph Objects, Inc.[illegible]LulzBot [illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

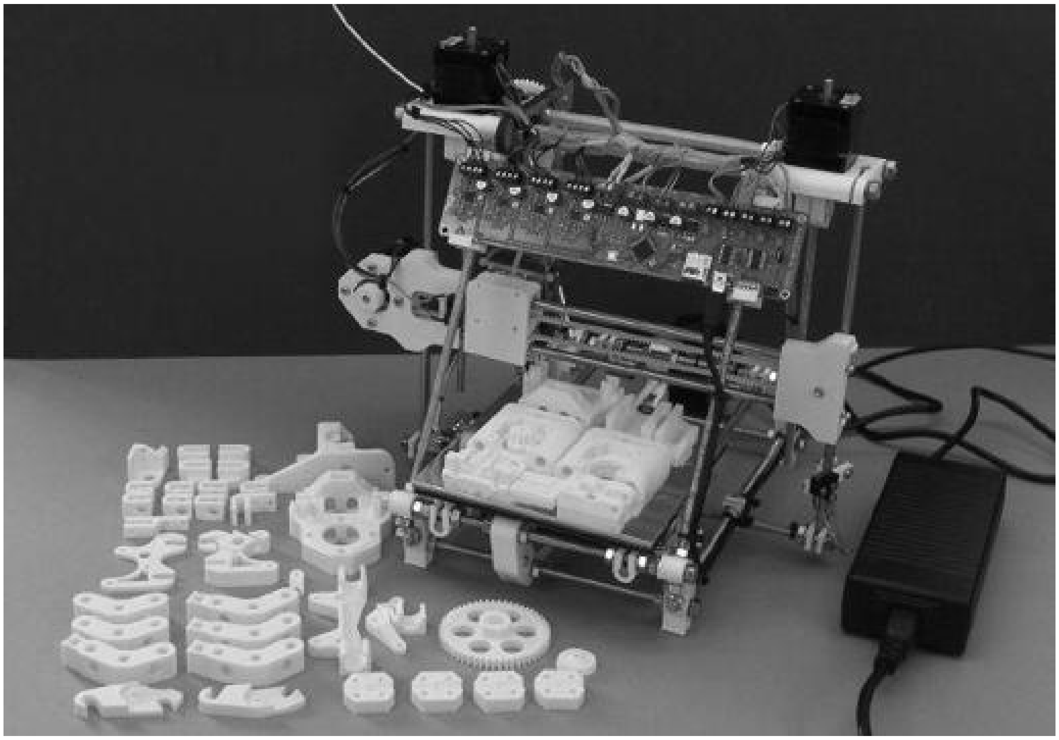
[illegible]

RepRap[illegible]

[illegible]3D[illegible]3D[illegible]—[illegible]·[illegible]RepRap[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]20[illegible]”

“[illegible]·[illegible]20[illegible]”[illegible]“[illegible]”

[illegible]2004[illegible]RepRap[illegible]RepRap[illegible]·[illegible]



[illegible]12–2

[illegible]RepRap[illegible]3D[illegible]

[illegible]Adrian Bowyer and the RepRap project

[illegible]RepRap[illegible]RepRap[illegible]RepRap[illegible]RepRap[illegible]—[illegible]RepRap[illegible]

[illegible]RepRap[illegible]RepRap[illegible]1 000[illegible]RepRap[illegible]RepRap[illegible]3D[illegible]RepRap[illegible]

[illegible]……[illegible]RepRap[illegible]

[illegible]—[illegible]

□□□□□□□□□□□□□□□□□□“□□□‘□□□□□□□□□□□□□’”□□□□□□□“□□□□□□□□□□□□”

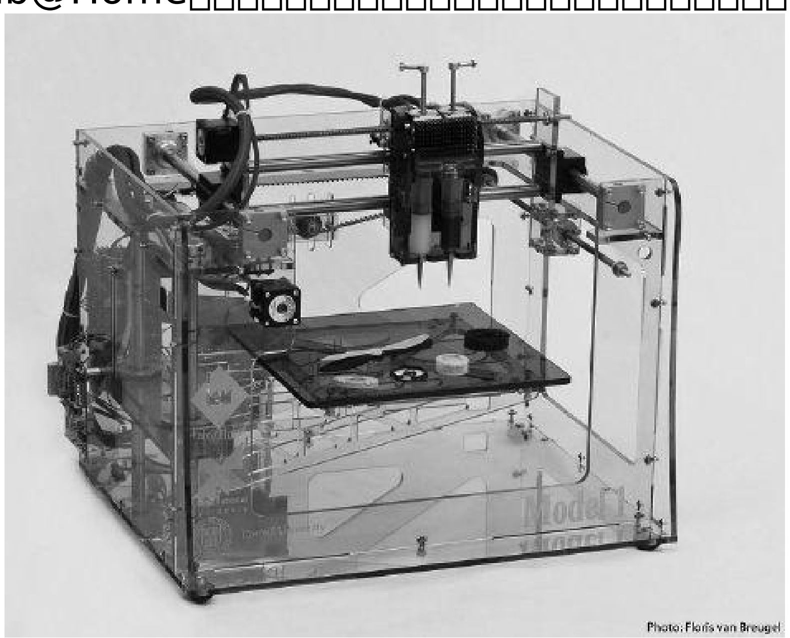
RepRap□□RepRap□□□□□

□□□□□“□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□”□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

□□□□□□□RepRap □ Fab@Home□□“RepRap□□□RepRap□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□”

□□□□□□RepRap□□□□□□□□□□□□□□Fab@Home□□□□□RepRap□□□□□□□□□□□□□□□□□□RepRap□Fab@Home□□□□□□□□□□□□□□□□□□□□□□□□

□RepRap □ Fab@Home □□□□□□□□□□□□□□□□□□□□MakerBot□□“□□1□”—□□□□□□□3D□□□□□□□□□□□□□□RepRap□Fab@Home□□□□□□□□□□□□□□□□□□□□□□□□□



□12–3 Fab@Home□□3D□□□□□2006□□

□□□□□the Fab@Home team. Photo: Floris van Breugel

□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□RepRap□Fab@Home□□□□□□□□□□□□□□□□□□□□□□□□3D□□□□□

RepRap[illegible]RepRap[illegible]RepRap[illegible]3D[illegible]—[illegible]3D[illegible]RepRap[illegible]3D[illegible]RepRap[illegible]3D[illegible]

[illegible]RepRap[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]DRM[illegible]“[illegible]”

[illegible]21[illegible]

RepRap[illegible]Fab@Home[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]·[illegible]·[illegible]

[illegible]

[illegible]21[illegible]20[illegible]20[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]5[illegible]20[illegible]

[illegible]5[illegible]

[illegible]1‰[illegible]

[illegible]

3D[illegible]

[illegible]

[illegible]·[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]“bio”[illegible]3D[illegible]

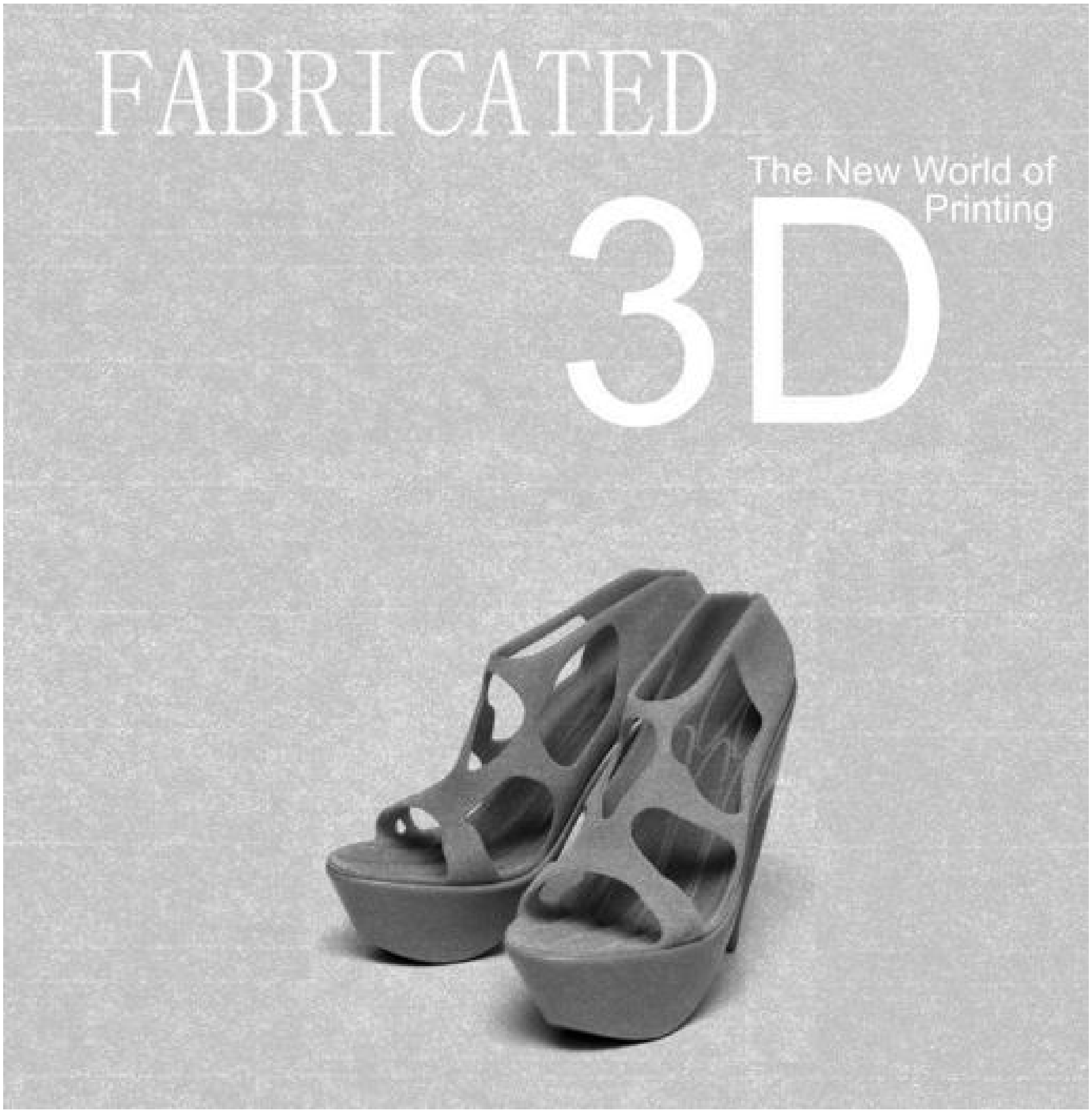
[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”

3D[illegible]3D[illegible]

[illegible]13[illegible] [illegible]3D[illegible]



[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

3D[illegible]“[illegible]”[illegible]3D[illegible]“[illegible]”

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]·[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]·[illegible]“[illegible]”

[illegible]1990[illegible]·[illegible]“[illegible]”[illegible]

[illegible]9[illegible]

[illegible]3D[illegible]

3D[illegible]

[illegible]·[illegible]·[illegible]“[illegible]8[illegible]3D[illegible]”[illegible]“[illegible]”

[illegible]Mineways[illegible]3D[illegible]

Mineways[illegible]3D[illegible]Mineways[illegible]45[illegible]Mineways[illegible]2011[illegible]Mineways[illegible]50 000[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]800[illegible]

[illegible]—Vokselia[illegible]“[illegible]”[illegible]—[illegible]3D[illegible]

[illegible]1[illegible]

[illegible]“[illegible]”

[illegible]20[illegible]

[illegible]—[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]

[illegible]

[illegible]

[illegible]27[illegible]

[illegible]8[illegible]8[illegible]

[illegible]TNT[illegible]

[illegible]

[illegible]“[illegible]”

[illegible]（Solid Angle[illegible]·[illegible]·[illegible]·[illegible]6[illegible]

[illegible]

[illegible]13–1[illegible]



[illegible]13–1

[illegible]·[illegible]·[illegible]·[illegible]Lee Griggs (Solid Angle SL) and Tomás Fernandez Serrano (forominecraft. com). Rendered with the Arnold globad illumination renderer.

[illegible]20[illegible]80[illegible]3D[illegible]

[illegible]3D[illegible]

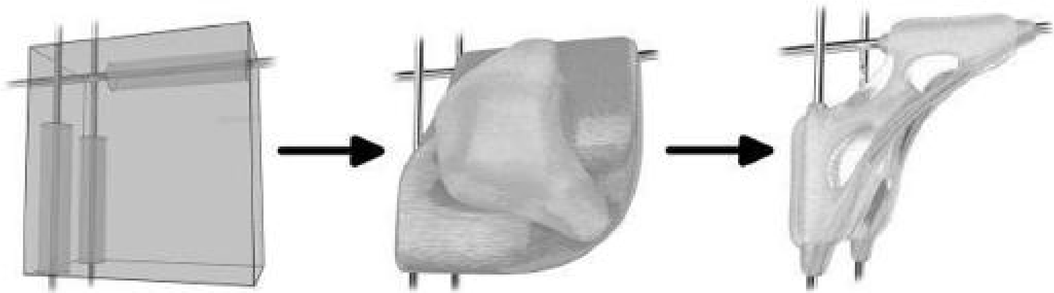
[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]6[illegible]50[illegible]”[illegible]3D[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]



[illegible]13–2

[illegible]3D[illegible]

[illegible]Jonathan Hiller

[illegible]“[illegible]”[illegible]

[illegible]·[illegible]*The Diamond Age*[illegible]3D[illegible]“[illegible]”[illegible]Replicator[illegible]

[illegible]3D[illegible]“[illegible]”[illegible]3D[illegible]3D[illegible]

[illegible]C++[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]20[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

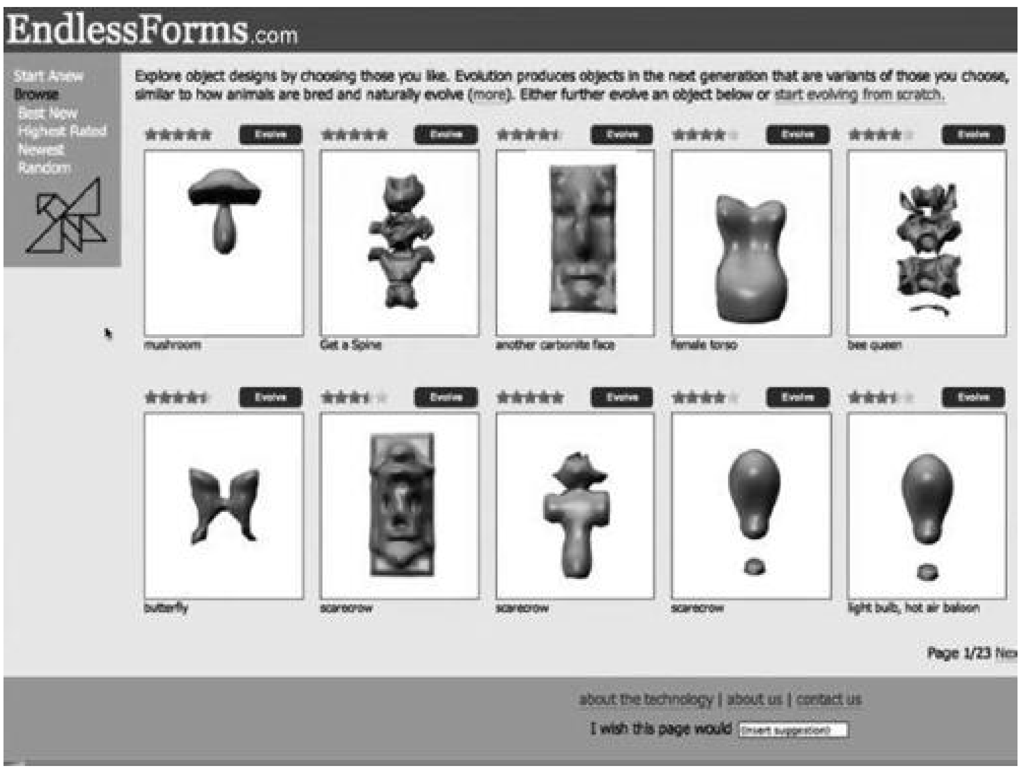
[illegible]“[illegible]”[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]·[illegible]“[illegible]”[illegible]

[illegible]



[illegible]13–3

[illegible]

[illegible]Jeff Clune and Jason Yosinski

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]
300[illegible]

[illegible]

[illegible]

[illegible]

[illegible]·[illegible]·[illegible]

[illegible]

3D[illegible]3D[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]DNA[illegible]

3D[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]3[illegible]0.5[illegible]1 000[illegible]1 000[illegible]“[illegible]”[illegible]“[illegible]”[illegible]



[illegible]13–4 [illegible]

[illegible]Nervous System, Inc.

[illegible]DNA[illegible]DNA[illegible]DNA[illegible]

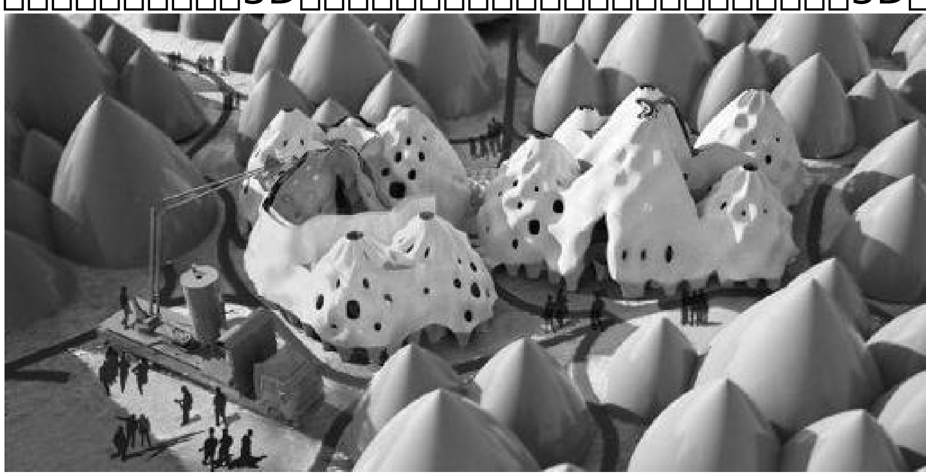
[illegible]

[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]



[illegible]13–5 [illegible]

[illegible]Project “DIGITAL VERNACULAR” by Shankara S. Kothapuram, Mei-ling Lin, Ling Han, Jiawei Song, part of design studio: “Machinic Control” led by Marta Malé-Alemany and taught with Jeroen van Ameijde at the Architectural Association School of Architecture,

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]·[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]

[illegible]3D[illegible]3D[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]3D[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]10[illegible]

[illegible]

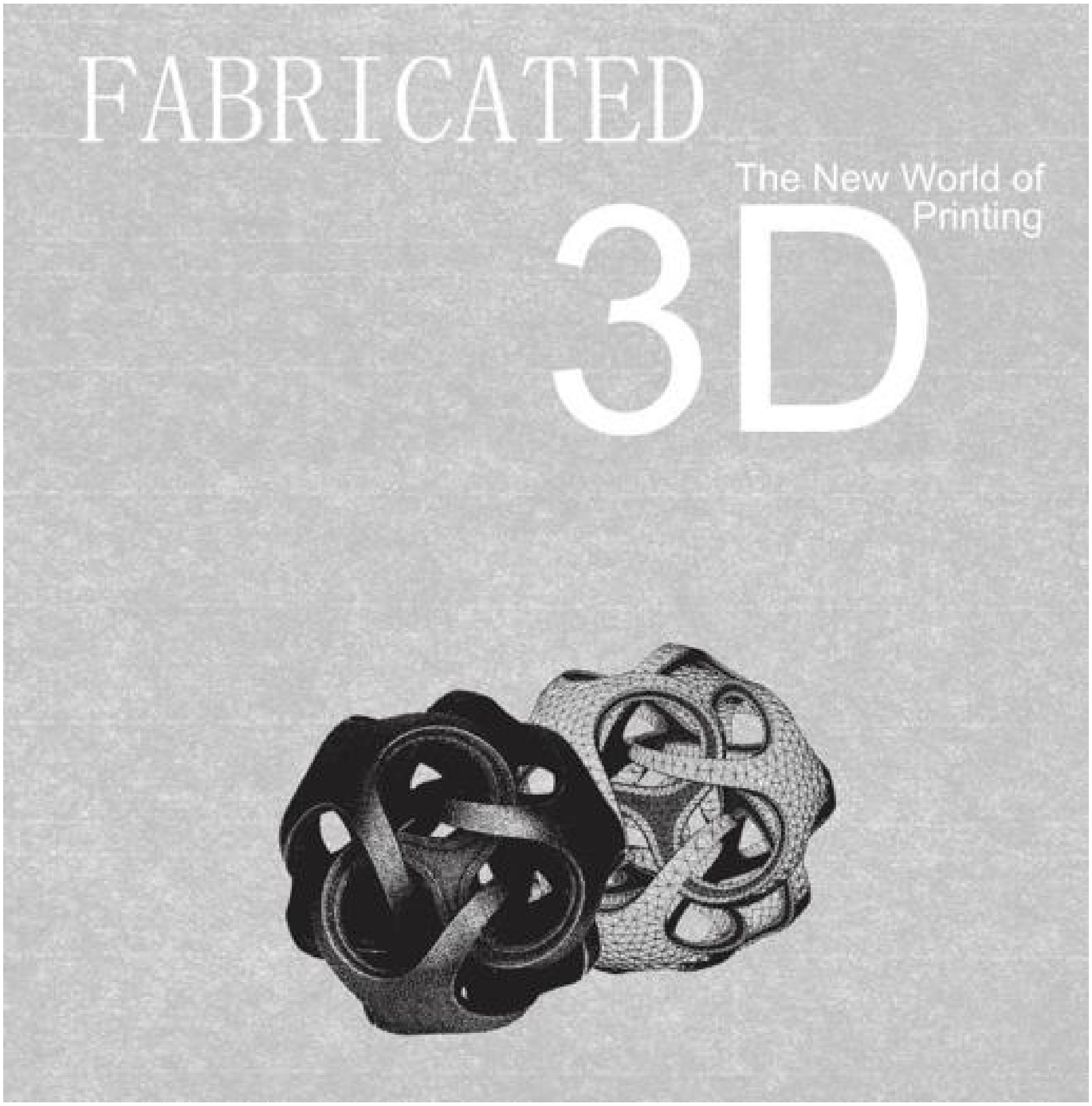
[illegible]

[illegible]

[illegible]3D[illegible]

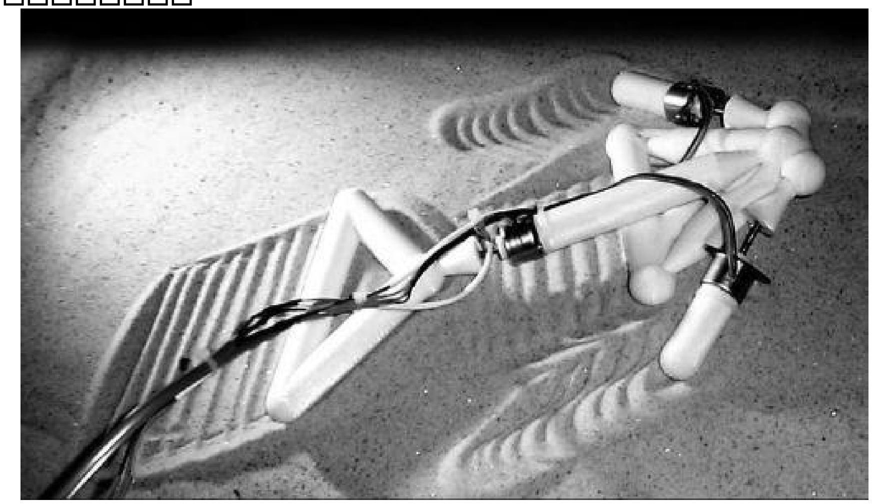
[illegible]·[illegible]“[illegible]”

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3D[illegible]

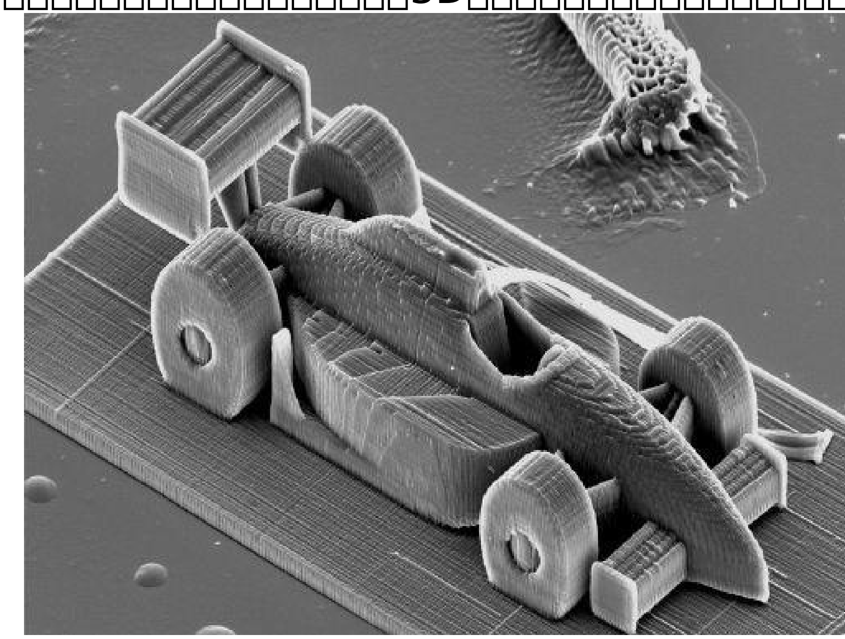

FABRICATED
The New World of
3D
Printing

[illegible]3D[illegible]
[illegible]
[illegible]“[illegible]”[illegible]
[illegible]

[illegible]3D[illegible]
[illegible]



[illegible]14–1　GOLEM[illegible]2000[illegible]
[illegible]3D[illegible]



[illegible]14–2　285[illegible]3D[illegible]
[illegible]Jürgen Stampfl,Vienna University of Techology

[illegible]·[illegible]“[illegible]”[illegible]
[illegible]3D[illegible]

[illegible]

3D[illegible]

[illegible]3D[illegible]

[illegible]
3D[illegible]

[illegible]—[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]—[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]
3D[illegible]

[illegible]8[illegible]8[illegible]

[illegible]3D[illegible]

[illegible]Objet[illegible]—[illegible]Stratasys [illegible]Objet [illegible]Objet[illegible]Objet[illegible]·[illegible]·[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]

[illegible]

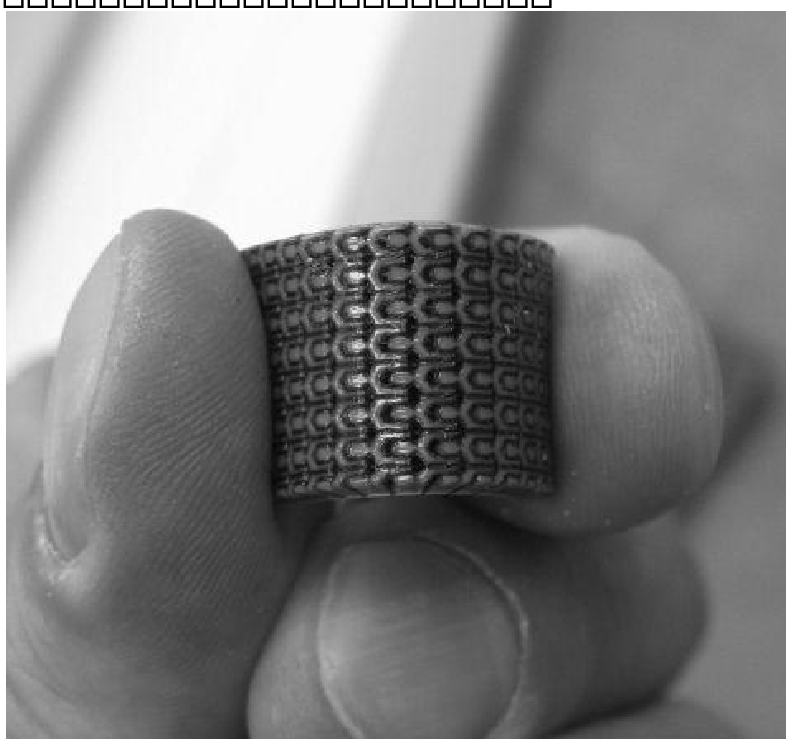
[illegible]

[illegible]“[illegible]”[illegible]

[illegible]·[illegible]·[illegible]（Auxetic Material）[illegible]

[illegible]3D[illegible]

[illegible]



[illegible]14–3 [illegible]
[illegible]Daniel Dikovsky, Objet Inc.

[illegible]Objet[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]Objet[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]—[illegible]

[illegible]

[illegible]Objet[illegible]3D[illegible]

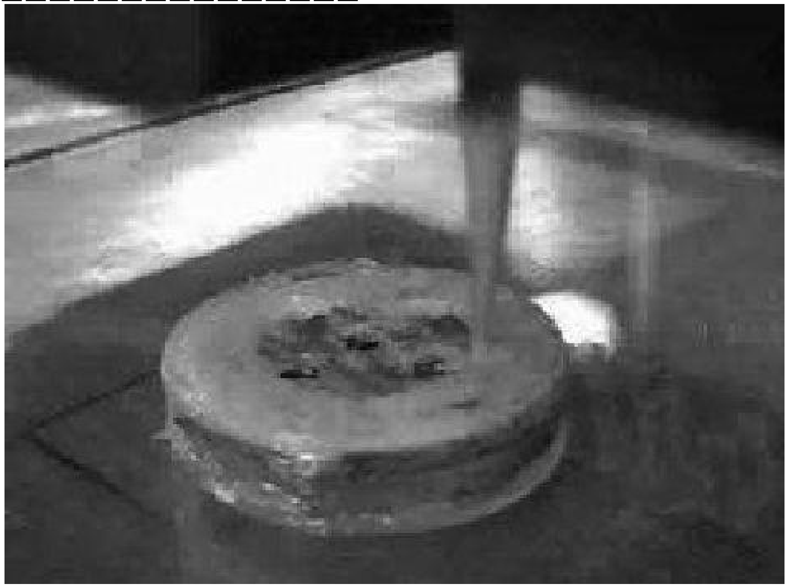
[illegible]3D[illegible]3D[illegible]

[illegible]

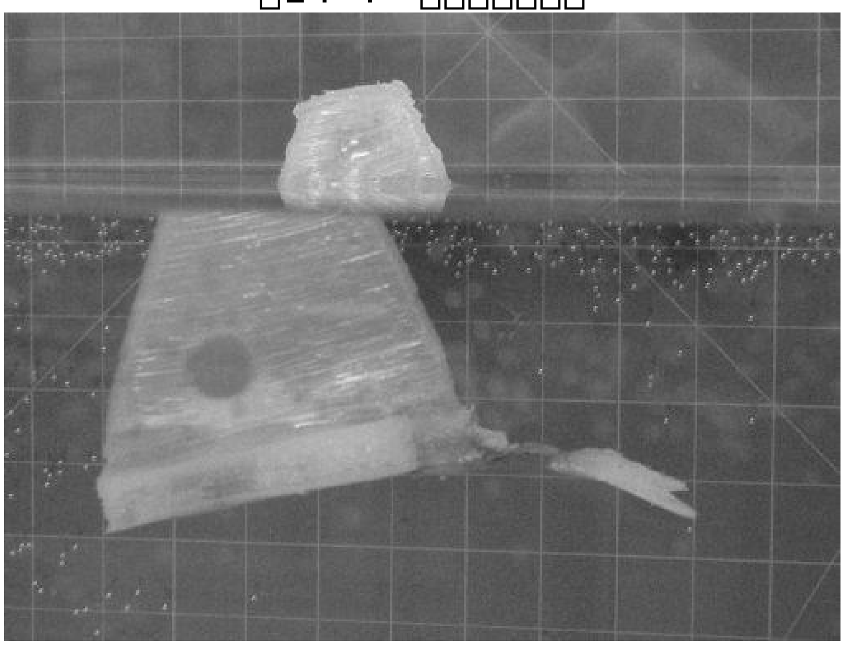
[illegible]

[illegible]3D[illegible]

[illegible]



[illegible]14–4 [illegible]



[illegible]14–5 [illegible]·[illegible]3D[illegible]2010[illegible]

[illegible]

[illegible]·[illegible]3D[illegible]

[illegible]10[illegible]

[illegible]Fab@ Home[illegible]RepRap[illegible]3D[illegible]DIY[illegible]

[illegible]3D[illegible]

[illegible]

[illegible]5[illegible]

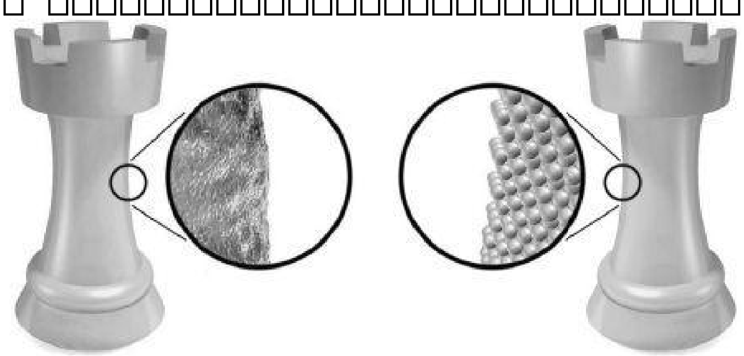
[illegible]

[illegible]

[illegible]“[illegible]”[illegible]

1. [illegible]“[illegible]VS[illegible]”[illegible]
2. [illegible]“[illegible]VS[illegible]”[illegible]
3. [illegible]“[illegible]VS[illegible]”[illegible]

[illegible]“0”[illegible]“1”[illegible]“[illegible]”[illegible]



[illegible]14–6 [illegible]

[illegible]

[illegible]Jonathan Hiller

[illegible]60[illegible]“0”[illegible]“1”[illegible]

[illegible]

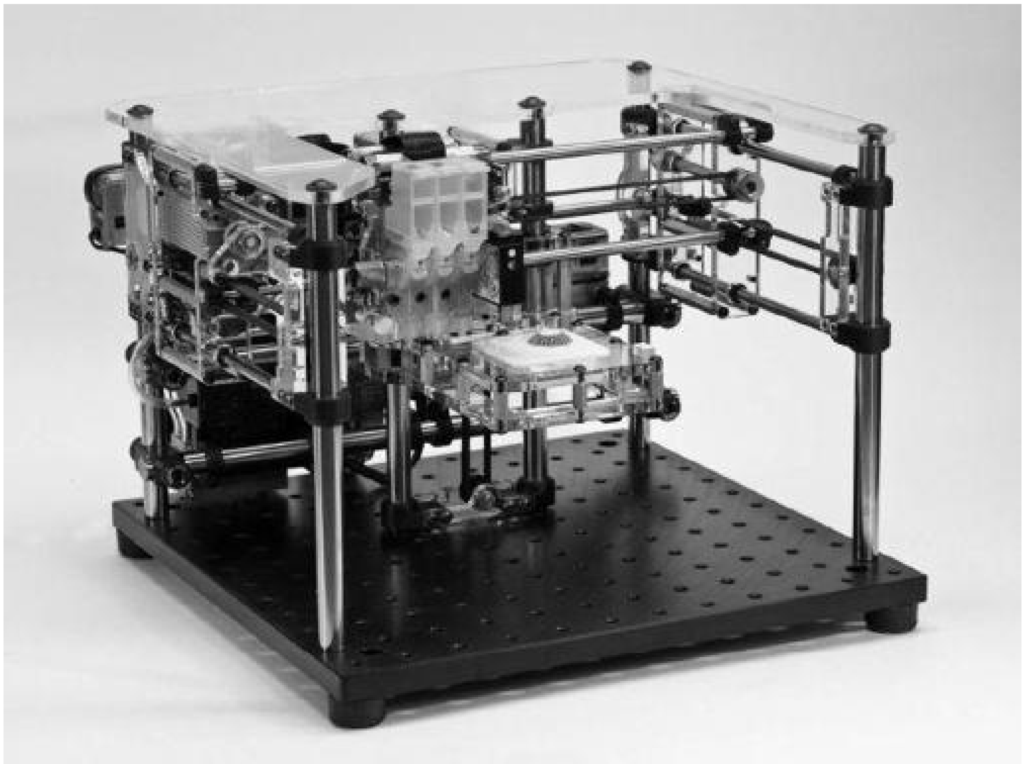
[illegible]·[illegible]2005[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]

[illegible]“[illegible]”[illegible]22[illegible]22[illegible]22[illegible]

[illegible]22[illegible]

[illegible]



[illegible]14–7

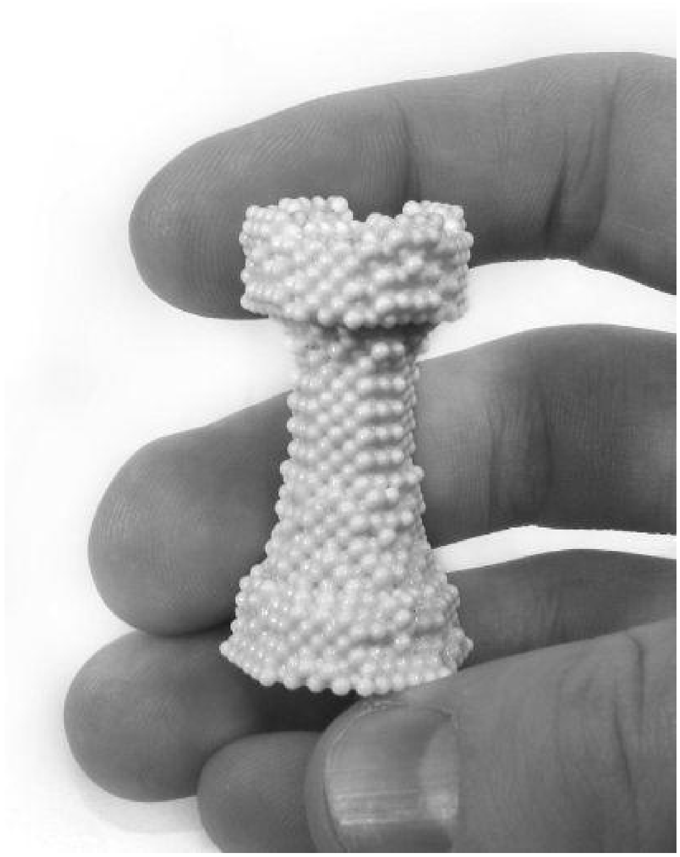
[illegible]3D[illegible]

[illegible]Jonathan Hiller

[illegible]24[illegible]

[illegible]

[illegible]3D[illegible]10[illegible]10[illegible]30[illegible]



[illegible]14–8

[illegible]1[illegible]

[illegible]

[illegible]Jonathan Hiller

[illegible]“[illegible]”[illegible]“[illegible]”[illegible]3D[illegible]

[illegible]–[illegible]

[illegible]100[illegible]24[illegible]



[illegible]14–9 [illegible]–[illegible]

[illegible]

[illegible]Robert MacCurdy

[illegible]3D[illegible]

[illegible]

[illegible]·[illegible]“[illegible]”[illegible]

[illegible]3D[illegible]

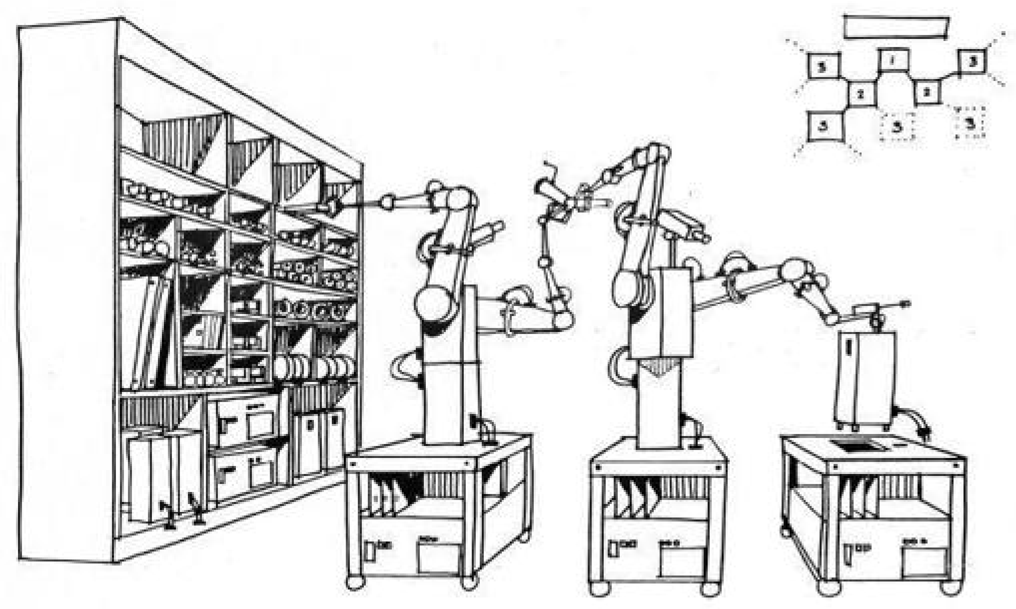
[illegible]3D[illegible]

[illegible]

[illegible]

[illegible]

[illegible]3D[illegible]



[illegible]14–10

[illegible]“[illegible]”[illegible]

[illegible]·A·[illegible]·P·[illegible]1981[illegible]

[illegible]Robert A .Freitas Jr. (www.rfreitas.com)

[illegible]“[illegible]”

[illegible]“[illegible]”

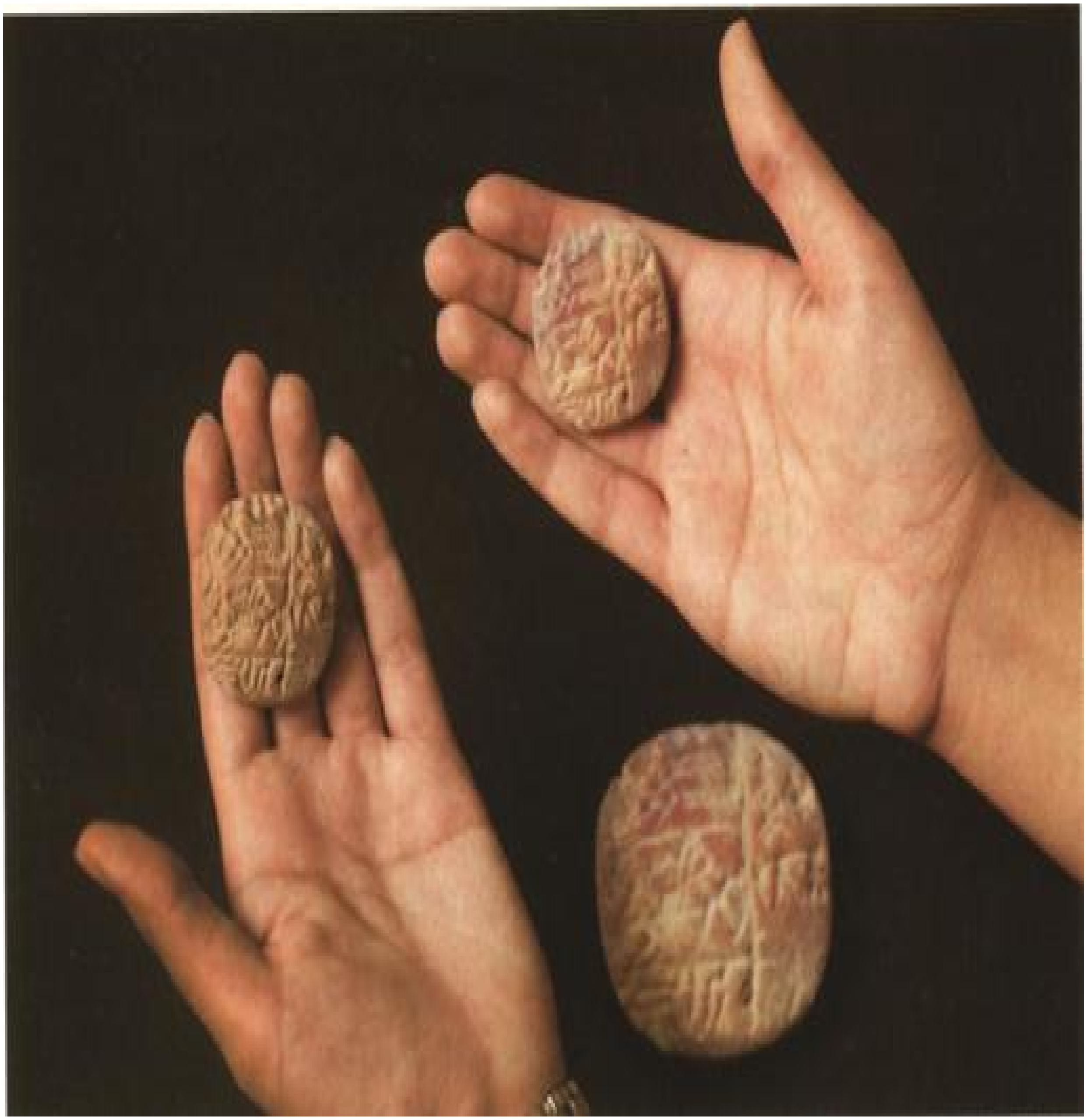
FABRICATED The New World of 3D Printing



□□□□□□□□□□□□□
□□□□□Andrea Morgante and Enrico Dini, D-Shape



[illegible]3D[illegible]
[illegible]
[illegible]Objet Inc.



[illegible]CT[illegible]3D[illegible]3D[illegible]

[illegible]Cornell University. Curator David I.Owen; Design: Natasha Gangjee; Photo



[illegible]3D[illegible]“[illegible]”[illegible]



□□□□□□□□□□□□□□□□□□□□□□3D□□□□□□□□□
□□□□□Printed on ZPrinter 650 courtesy of 3D Systems



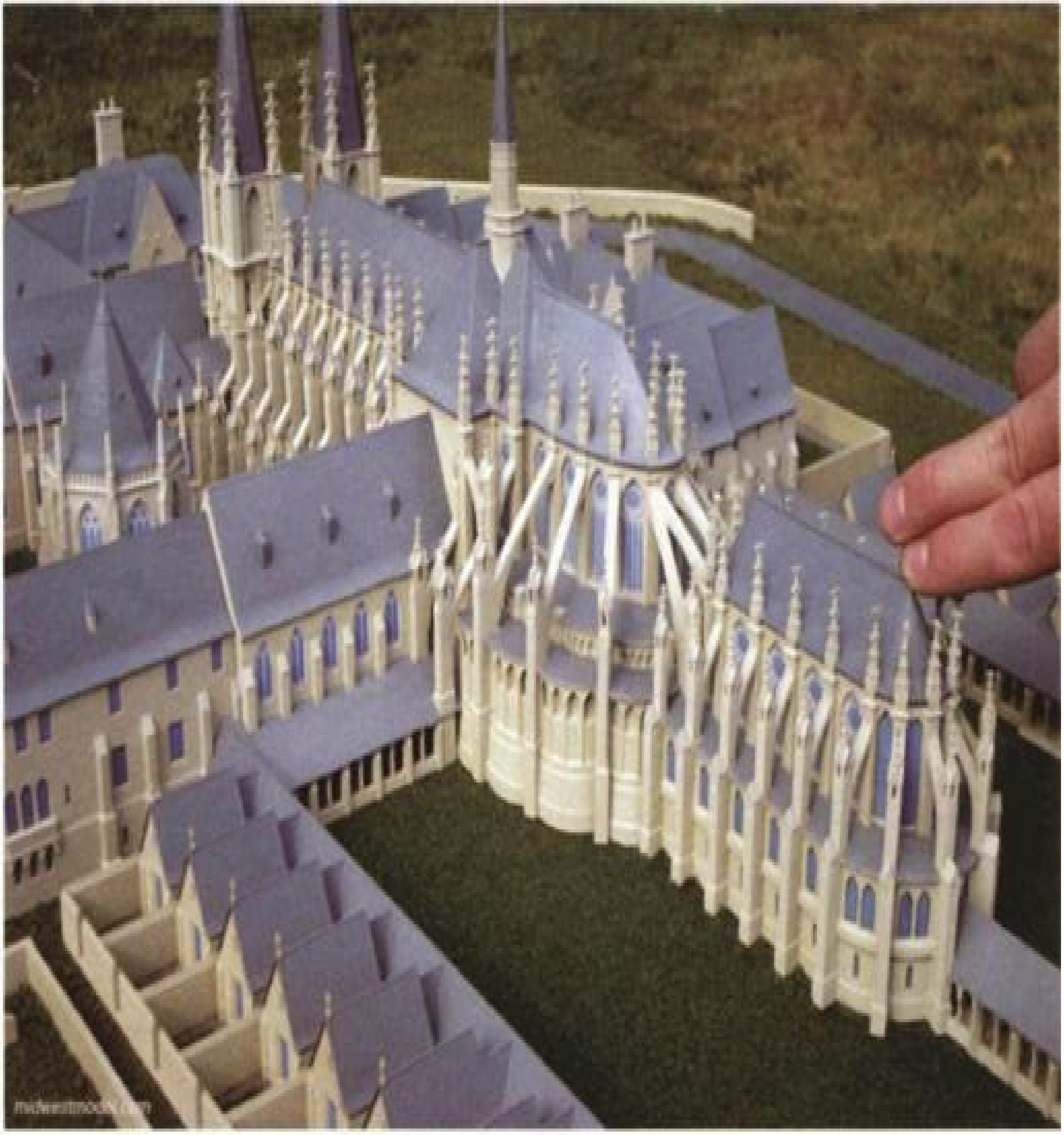
□□□□□□□□□□3D□□□□□□□□□
□□□□□Kerrie Luft



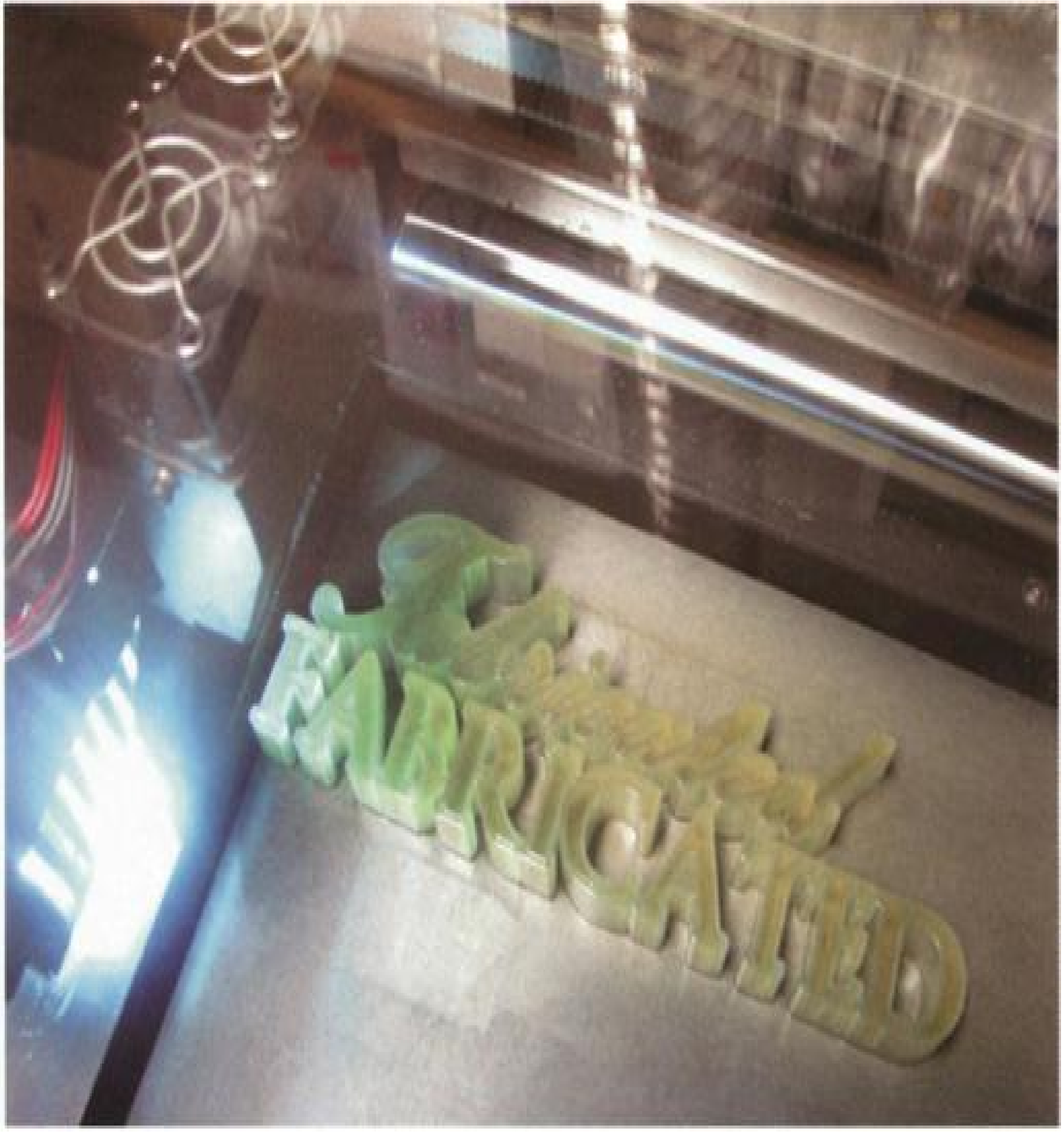
3D□□□□□□□□□□
□□□□□Olaf Diegel, New Zealand



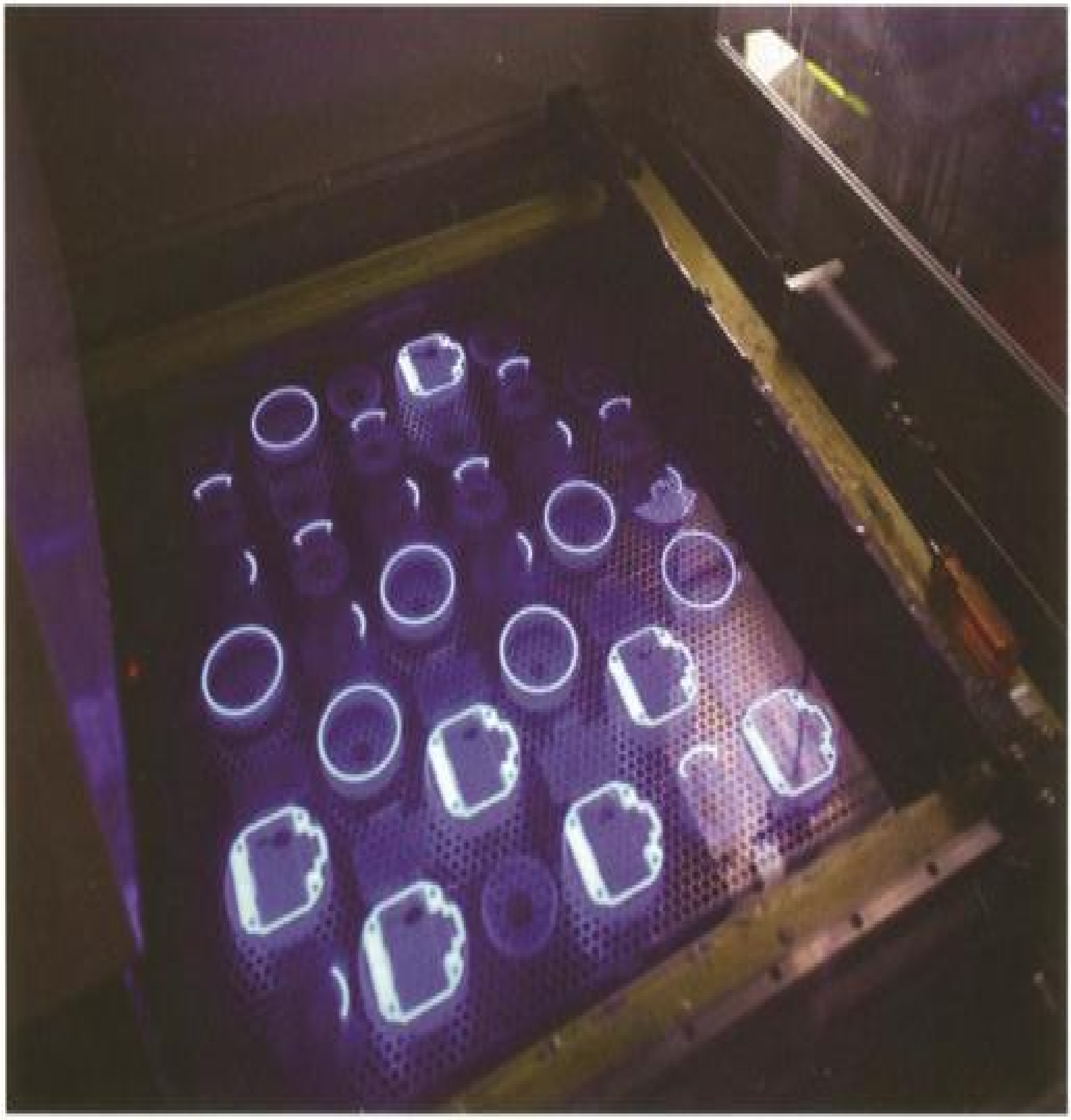
3D□□□□□□□□□□□□□□□□□—□□□□□
□□□□□ Objet Inc.



3D□□□□□□□□□□□□□□□□
□□□□□Midwest Studios. Photo: Ed Watson



Polyjet[illegible]



UV□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□Solid Concepts Inc.



Solid Concepts Inc.



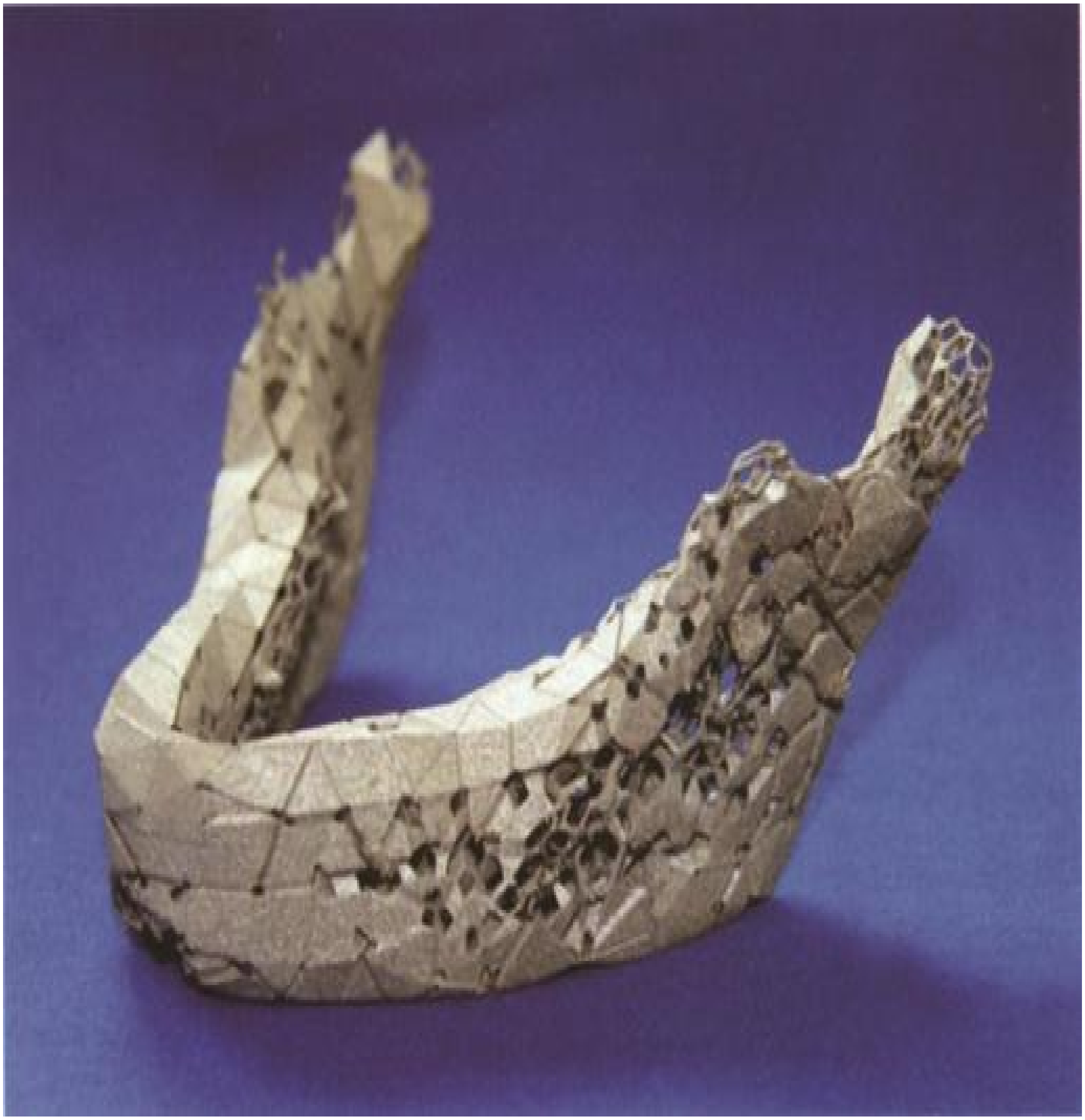
[illegible]
[illegible]3D Systems



□□Autodesk Inventor □□3D□□□□□□□□□□□□□□□
□□□□□Gonzalo Martinez, Autodesk



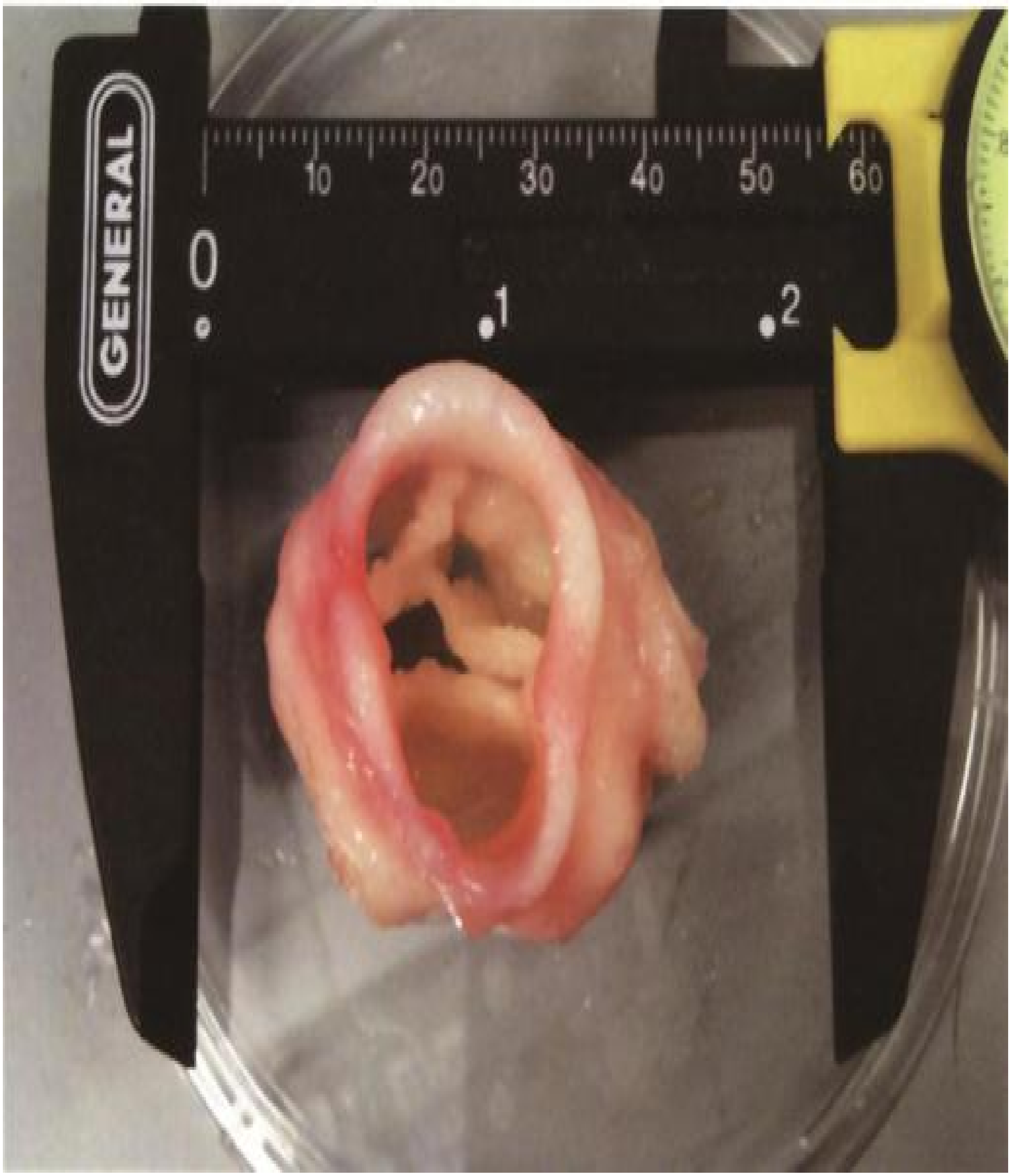
[illegible]
[illegible]3D Systems



[illegible]“[illegible]”[illegible]

[illegible]

[illegible]Fraunhofer IFAM



3D□□□□□□□

□□□□□Jonthan Butcher, Cornell University



[illegible]CT[illegible]
[illegible]Objet Inc.

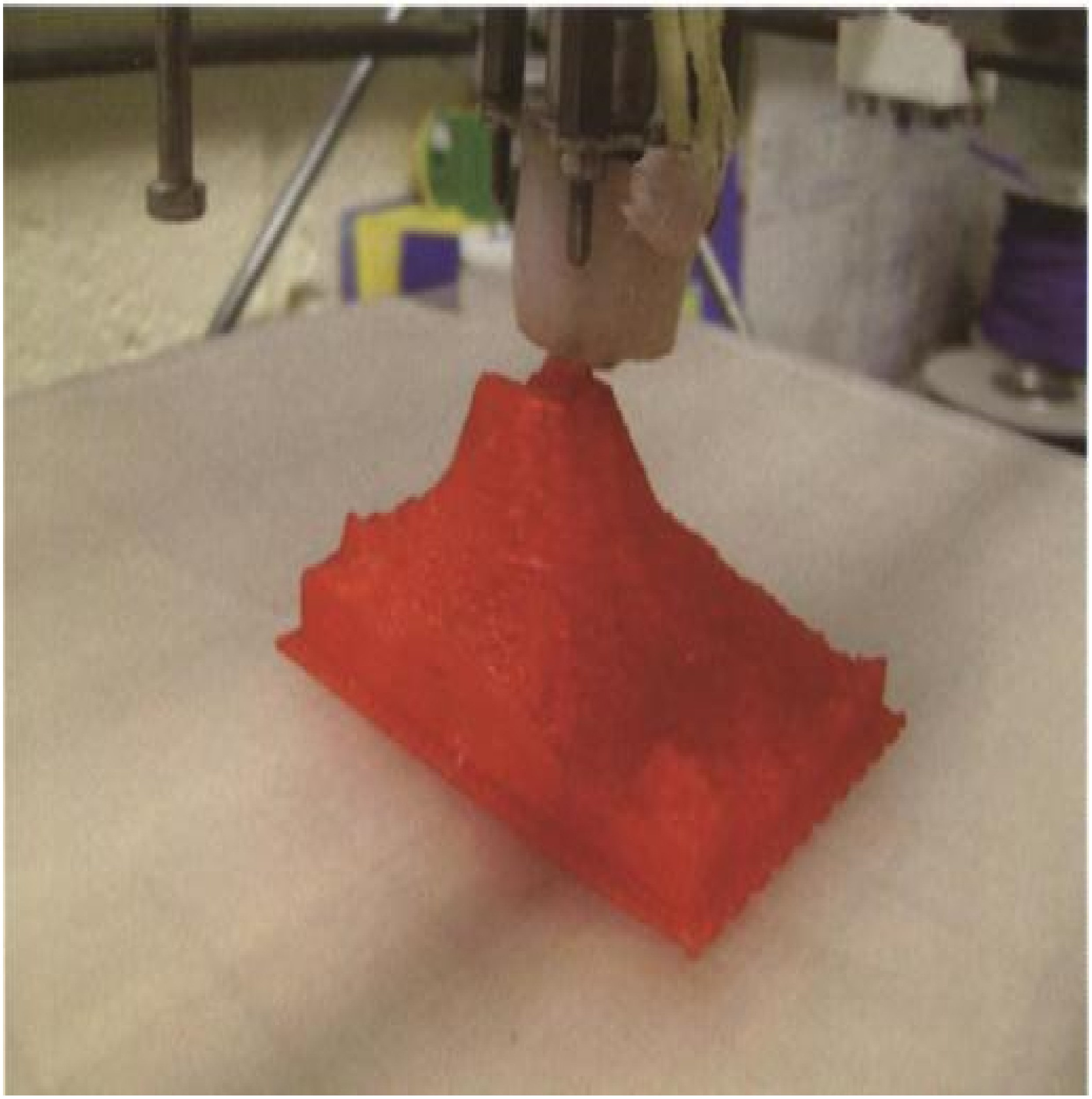


[illegible]3D[illegible]
[illegible]Windell H. Oskay, www.evilmadscientist.com



3D[illegible]

[illegible]Jeffrey Lipton, Cornell University

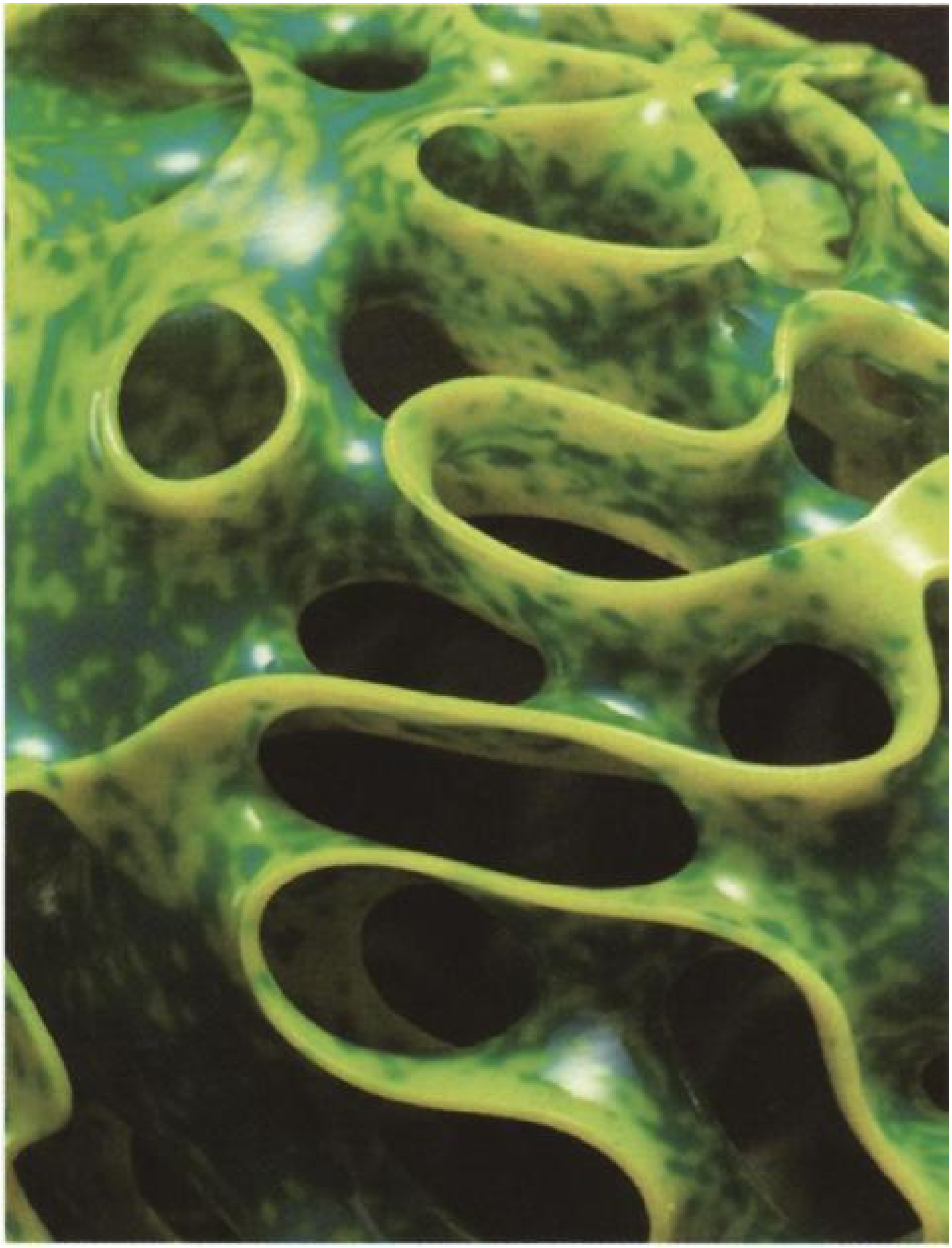


□□□□□3D□□□□

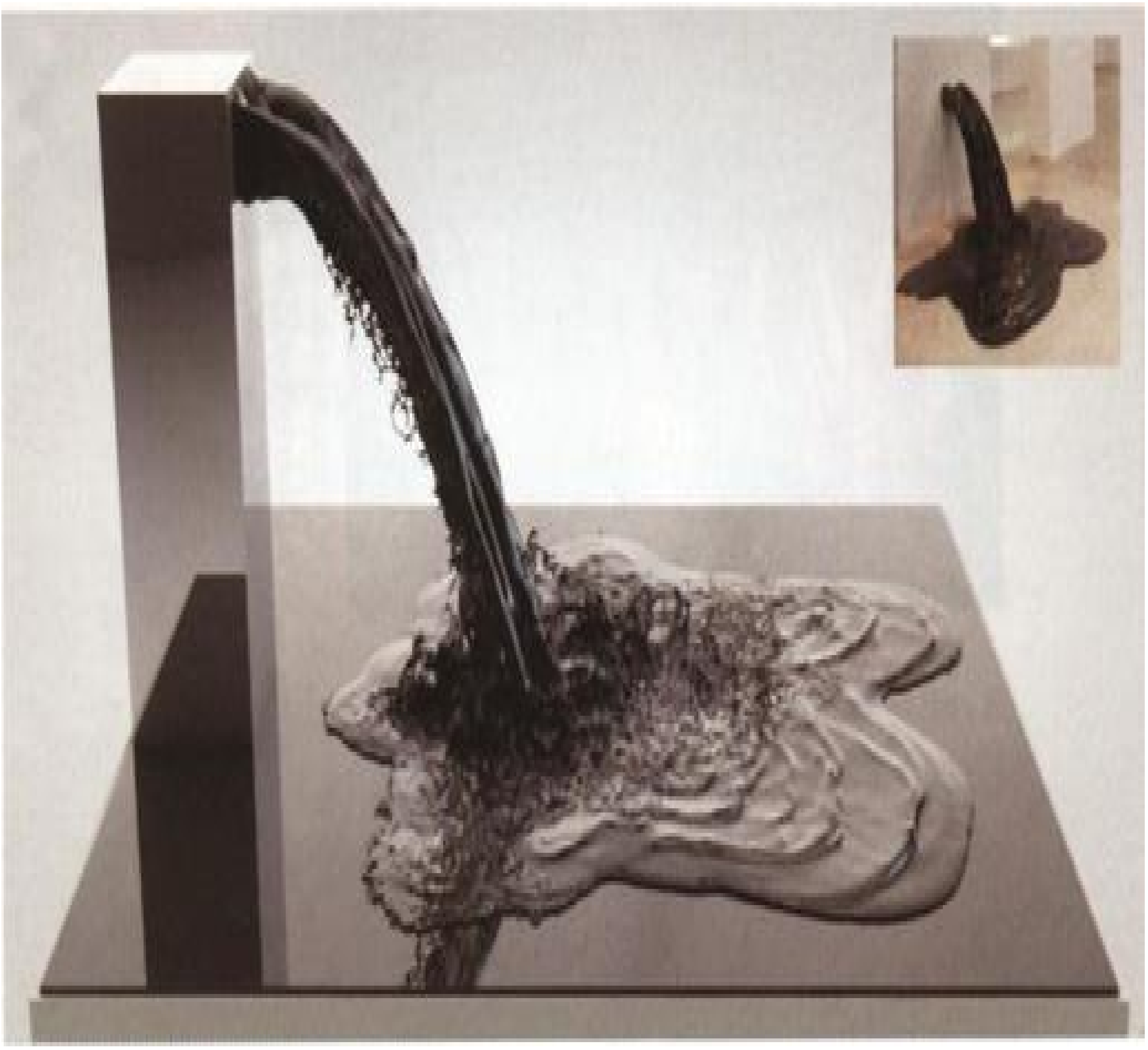
□□□□□Dave White, United Kingdom



□□□□□□□□□□□□□□□□□□□□□
□□□□□MGX, a division of Materialise. Designed by Gernot Oberfell, Jan Wertel,



[illegible]·[illegible]3D[illegible]
[illegible]
[illegible]Neri Oxman, W.Carter (MIT), Joe Hicklin (The Mathworks), Centre Pompidou, Paris, France, Photo: Yoram



[illegible]
[illegible]“[illegible]”[illegible]
[illegible]Eyal Gever
www.eyalgever.com



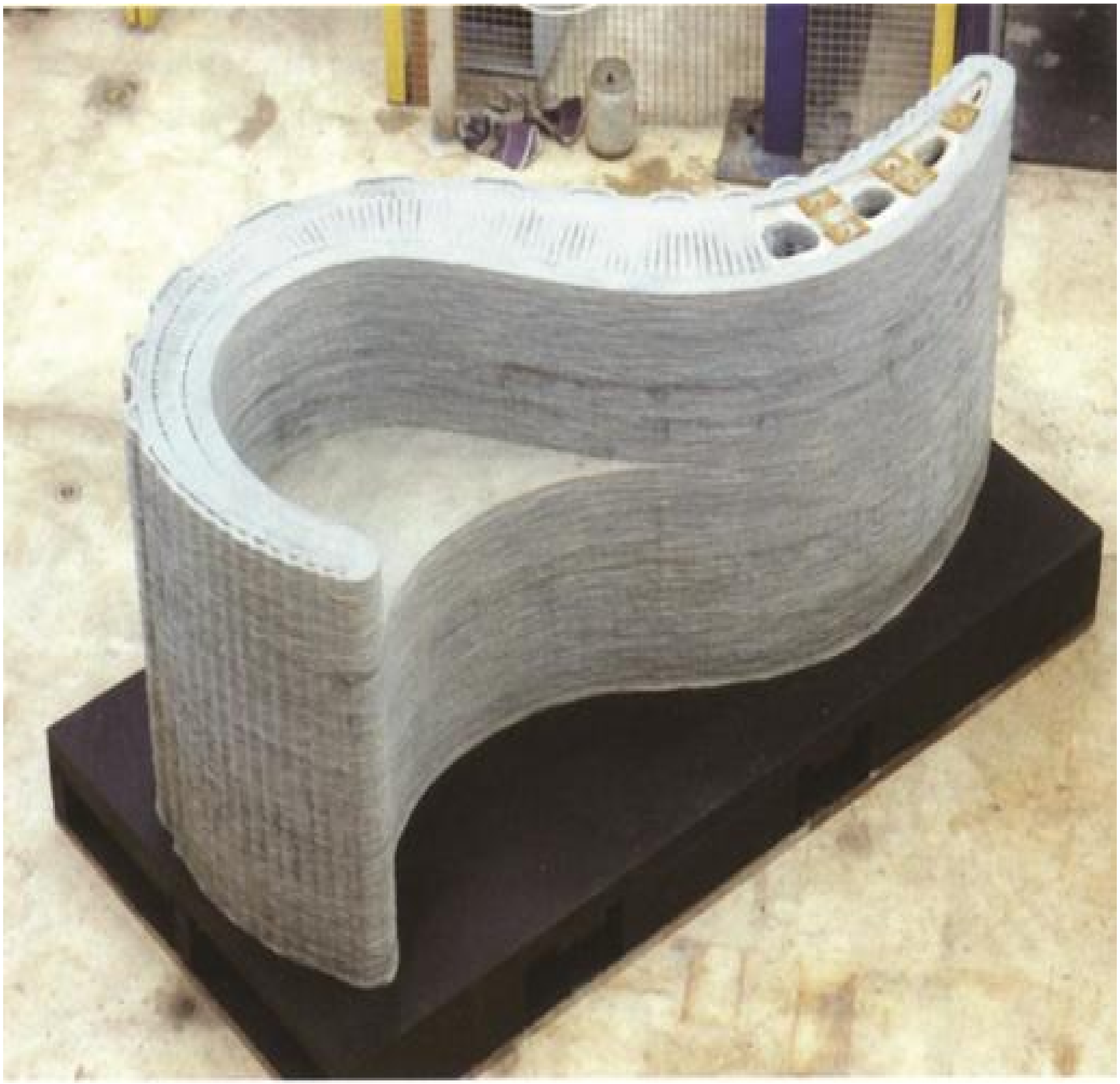
□□□□□□□□□□□□□·□□□□□3D□□□□□Within Technologies□□□□□□□□□□
□□□□□□□□□□□□□□□□□□□□□□□
□□□□□Ross Barber



□□□□□□□□□□□□□□□□Continuum Fashion□□□□·□□□□□□□□□3D□□□□
□□
□□□□□Jenna Fizel and Mary Huang, Continuum Fashion



□□□□□·□□□
□□□□□Enrico Dini and Andrea



□□“□□□□”□3D□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□Sungwoo Lim and Richard Buswell. Photo: Agnese Sanvito

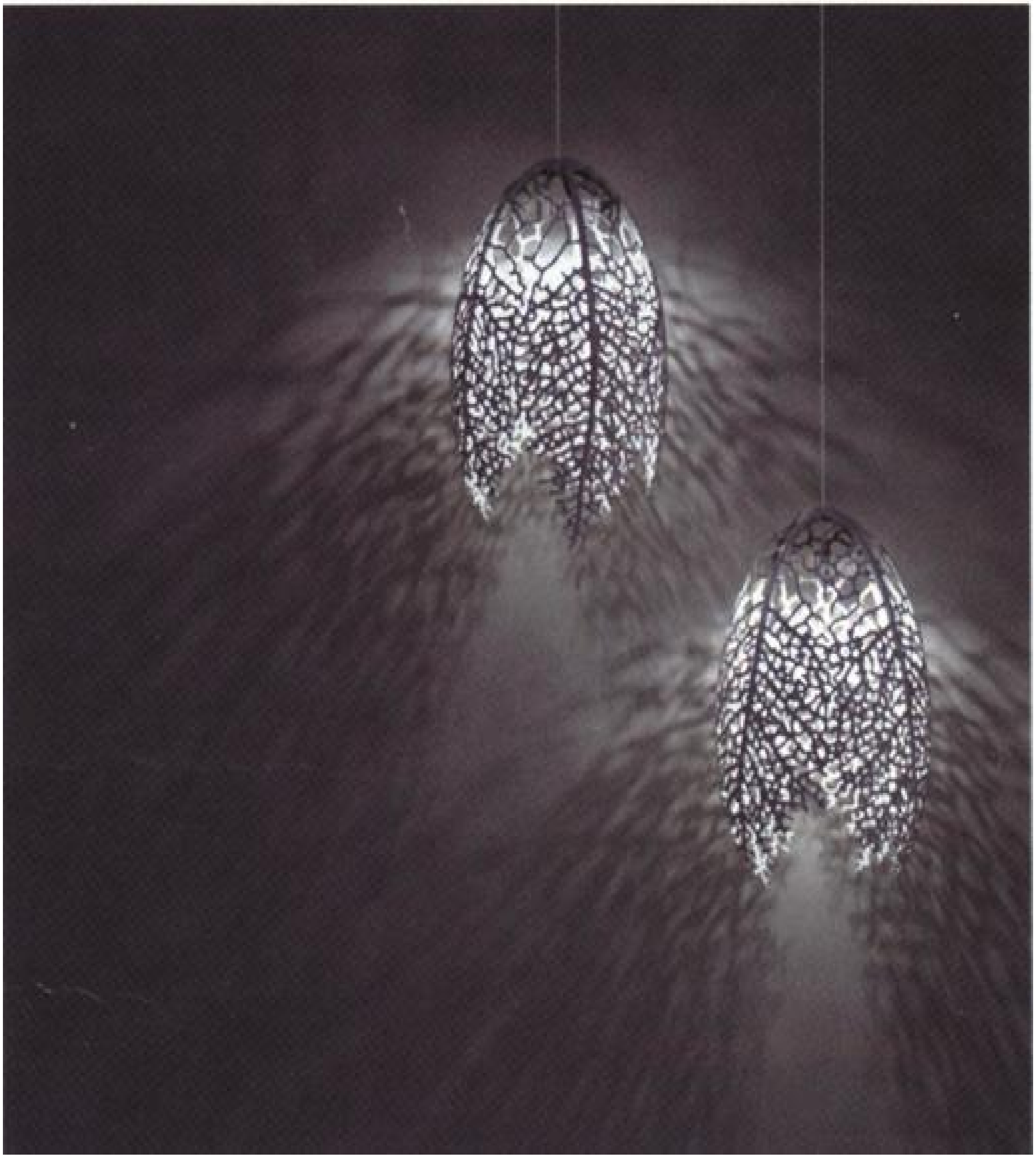


□3D□□□□□□□□□□22□□□□□□□□
□□□□□Michael Guslick



□□□·□□□□□□□□□·□□□□□□·□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□
□□□□□□□□□□□

□□□□□Lee Griggs (Solid Angle SL) and Tomás Fernandez Serraw (forominecraft. com). Rendered with the Arnold globad illumination rederer.



[illegible]
[illegible]Nervous System, Inc



[illegible]–[illegible]

[illegible]

[illegible]Robert MacCurdy

Table of Contents

Table of Contents